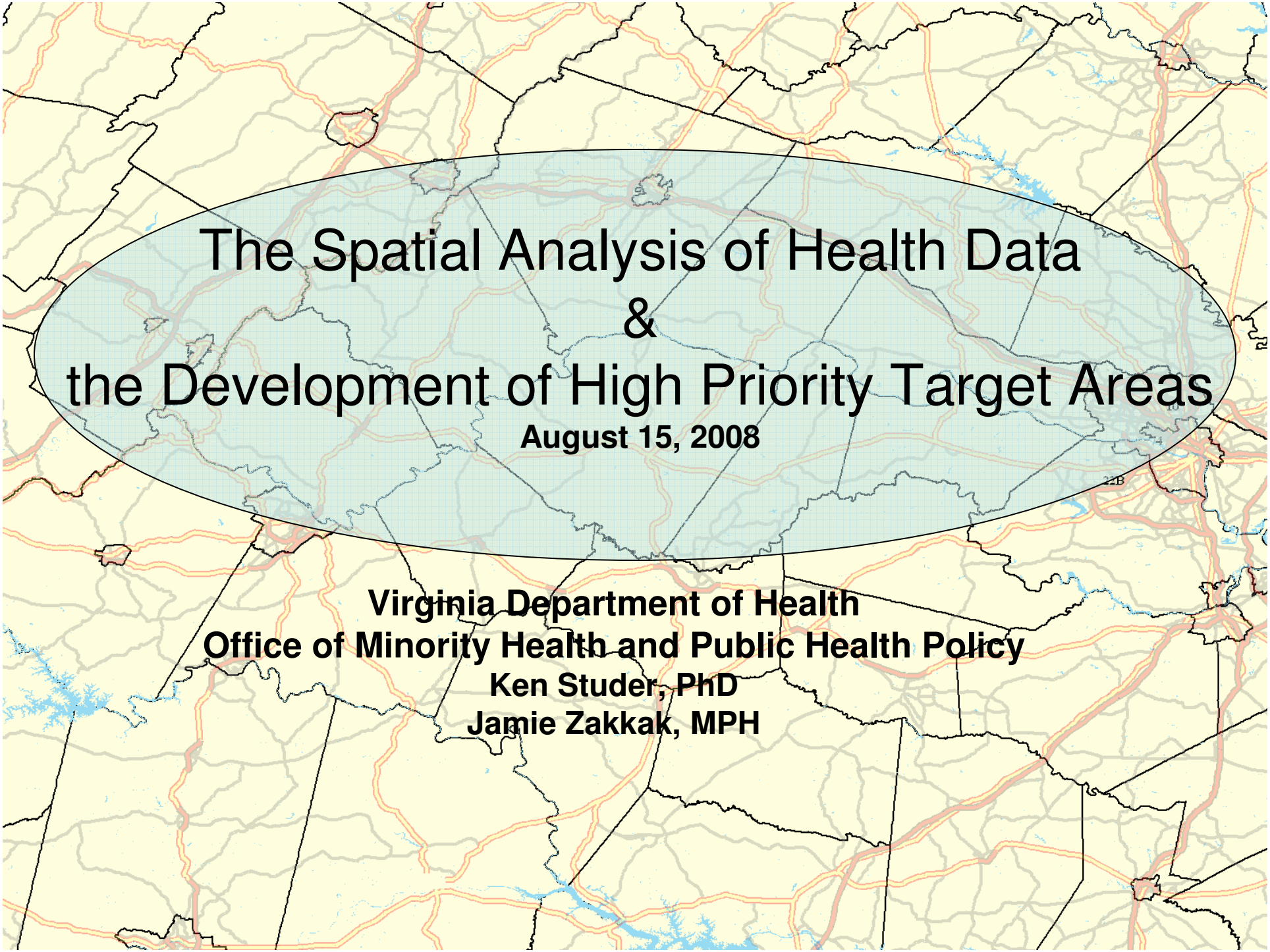


The Spatial Analysis of Health Data & the Development of High Priority Target Areas

August 15, 2008

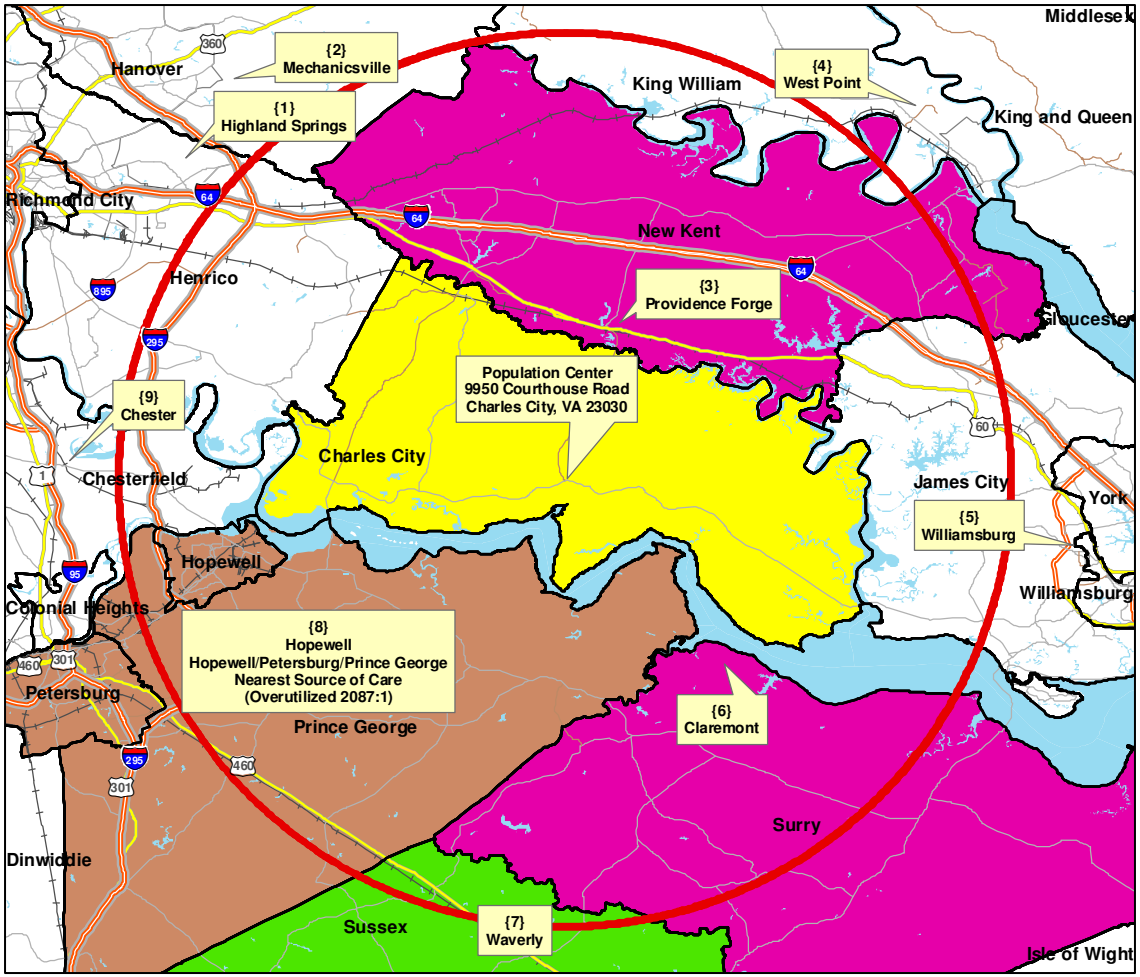
Virginia Department of Health
Office of Minority Health and Public Health Policy
Ken Studer, PhD
Jamie Zakkak, MPH

Overview

- Designations & the Targeting of Need
  - Examples (3)
  - HRSA Proposed Designation Criteria
- Multi-Level Analysis & Reframing the Question
  - County, Census Tract, Block Group, Community
  - Examples of High Priority Target Areas
- Analysis of Spatially Referenced Data
  - Levels of Aggregation
  - “Persistency” as a Social Variable
  - Locational Analysis
  - Various Service Area Analyses

Designations
&
Targeting Areas of Need

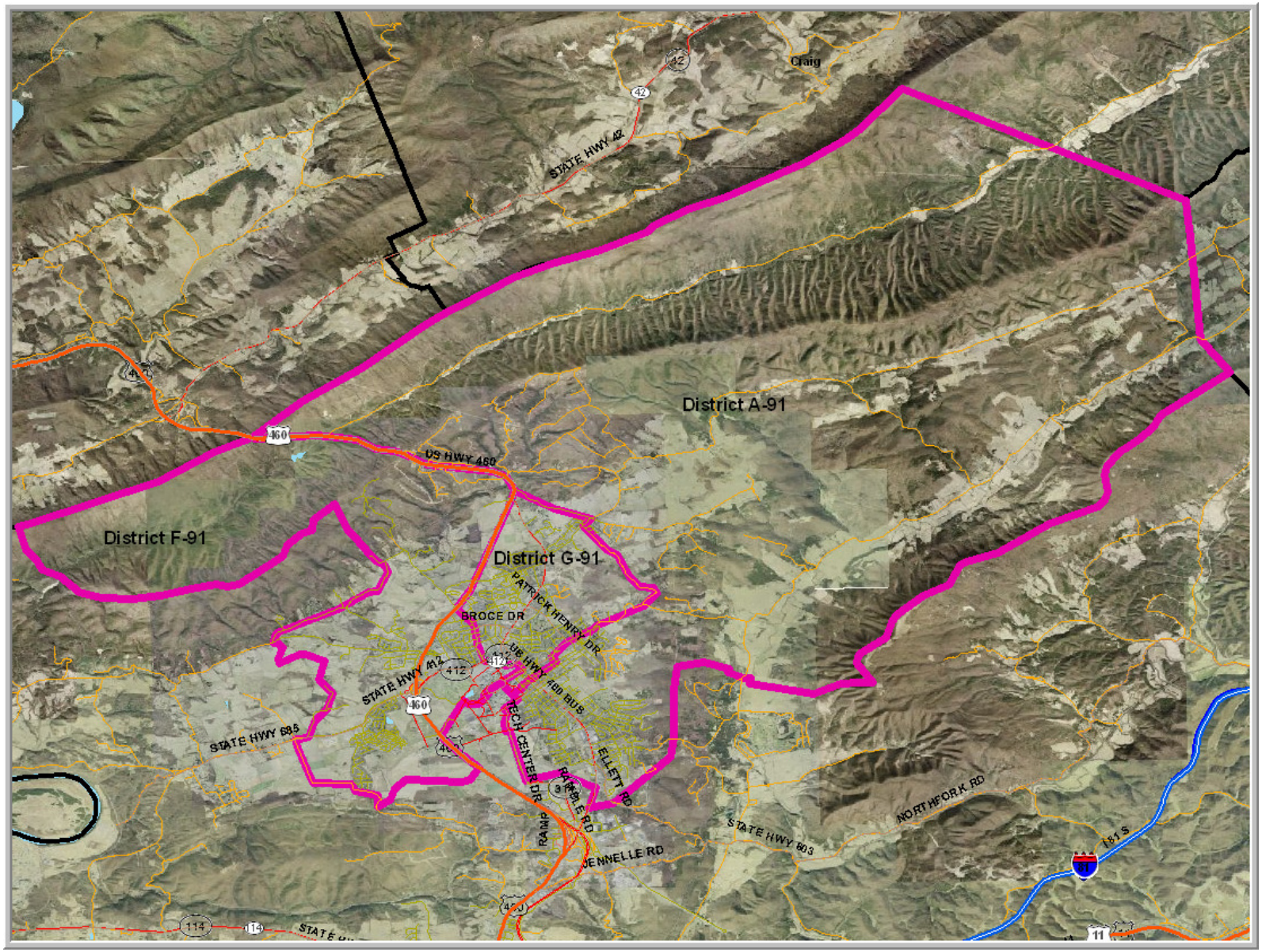
Charles City County and Contiguous Areas*



*Yellow = Rational Service Area
Purple = Designated Geographic Primary Care HPSA
Tan = Overutilized area

Montgomery County MUA Designation:

3 Minor Civil Divisions



NORFOLK, VA

Race and Poverty

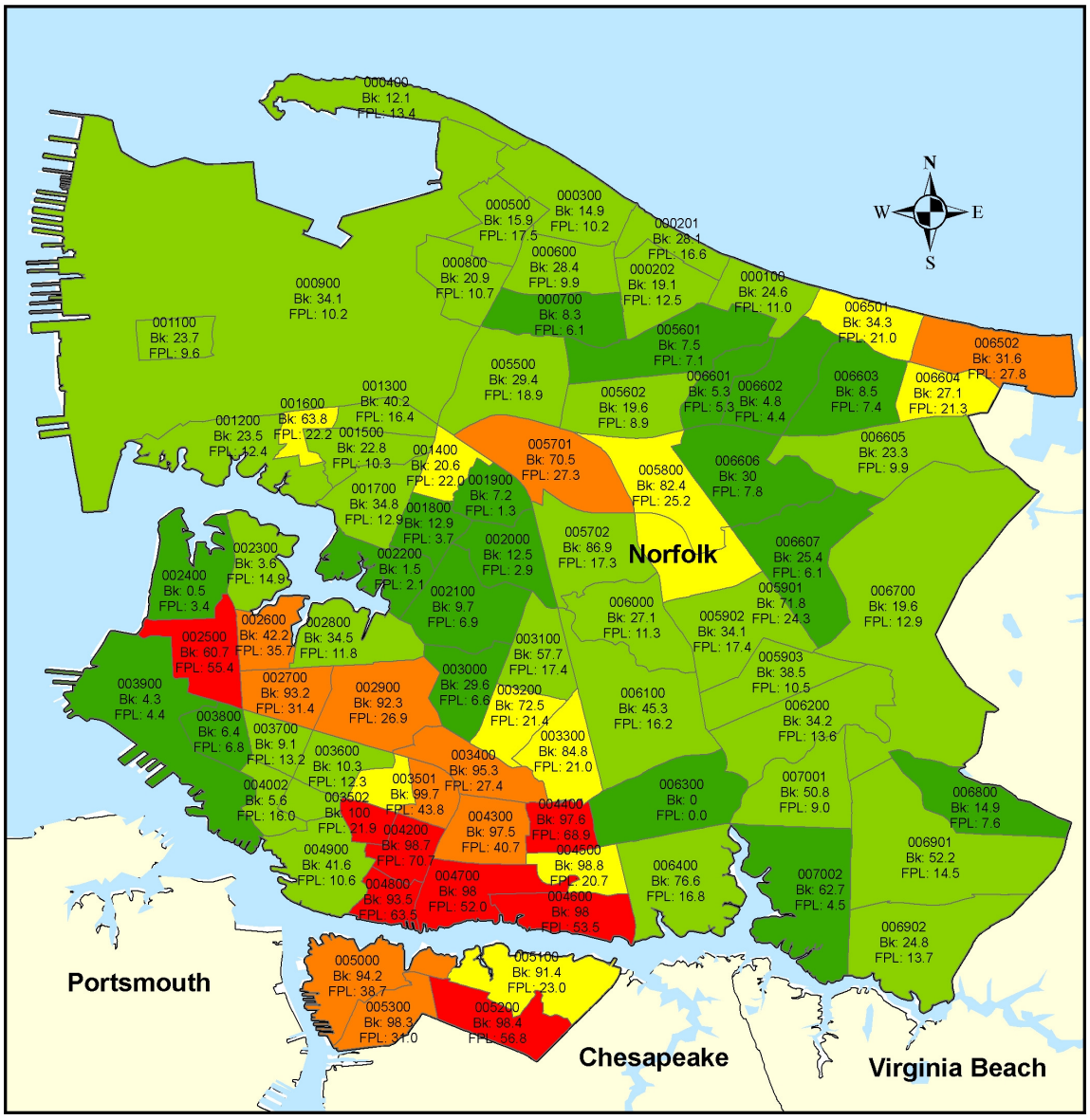
% population below Federal Poverty Level (FPL)

- 0.0 - 7.8
- 7.9 - 19.9
- 20.0 - 25.2
- 25.3 - 43.8
- 43.9 - 70.7

A Medically Underserved Area (MUA) designation within a metropolitian area must have a Rational Service Area (RSA), which consists of census tracts of homogeneous demographic (race) and/or socioeconomic (poverty) characteristics that differ significantly from contiguous census tracts.

In Norfolk, there are three non-contiguous RSAs based on race [Black population (Bk) over 70%] and/or poverty [population over 20% Federal Poverty Level (FPL)]. This maximizes the area that qualifies for MUA designation. A reduction in either of these criteria yields a higher Index of Medical Underservice (IMU) Score that would jeopordize the designation.

Demographic data are from Census 2000 and for MUA regulations see: http://bhpr.hrsa.gov/shortage/muaguide.htm



NORFOLK, VA

Primary Care Physician (PCP)* Distribution

Fort Norfolk
(36.856547, -76.304963)

PCP Practice Site
(may represent more than one PCP)

Pending MUA Census Tracts

* Primary Care Physicians include non-Federal doctors of medicine (M.D.) and doctors of osteopathy (D.O.) providing direct patient care who practice principally in one of the four primary care specialities -- general or family practice, general internal medicine, pediatrics, and obstetrics and gynecology.

Physician data was obtained from the Virginia Board of Medicine. Phone survey verification of current practice sites have only been completed for Pending MUA Rational Service Areas. (http://www.vahealthprovider.com/)

NORFOLK, VA

Medically Underserved Area (MUA)*

Pending MUA Census Tracts

Areas that do not meet MUA criteria

Previous MUA Census Tracts that no longer qualify

* MUA designations require a well-defined Rational Service Area (RSA), and an Index of Medical Underservice (IMU) Score below 62.

For computational methodology see: http://bhpr.hrsa.gov/shortage/muaguide.htm.

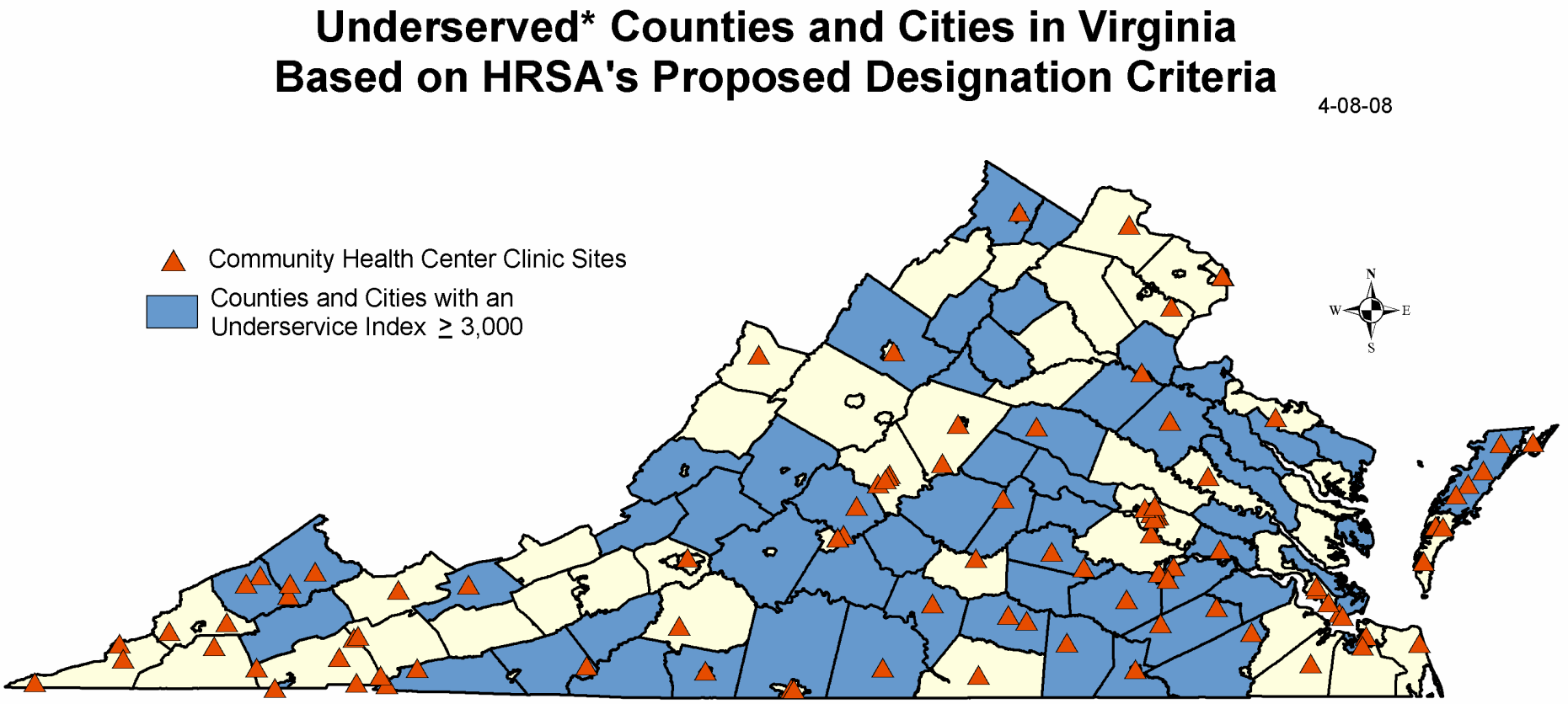
HRSA Proposed Designation Rules and the Determination of High Priority Target Areas

- HRSA variables

Demographic	Economic	Health Status
Percent non-White	Percent population <200% FPL	Acutal/expected death rate
Percent Hispanic	Unemployment rate	Low birth weight rate
Percent population >65 years		Infant mortality
Population density		

- Additional variables can be considered, such as: linguistic isolation, distance to services, fiscal stress, etc.

Impact Analysis I: Proposed Designation Rules



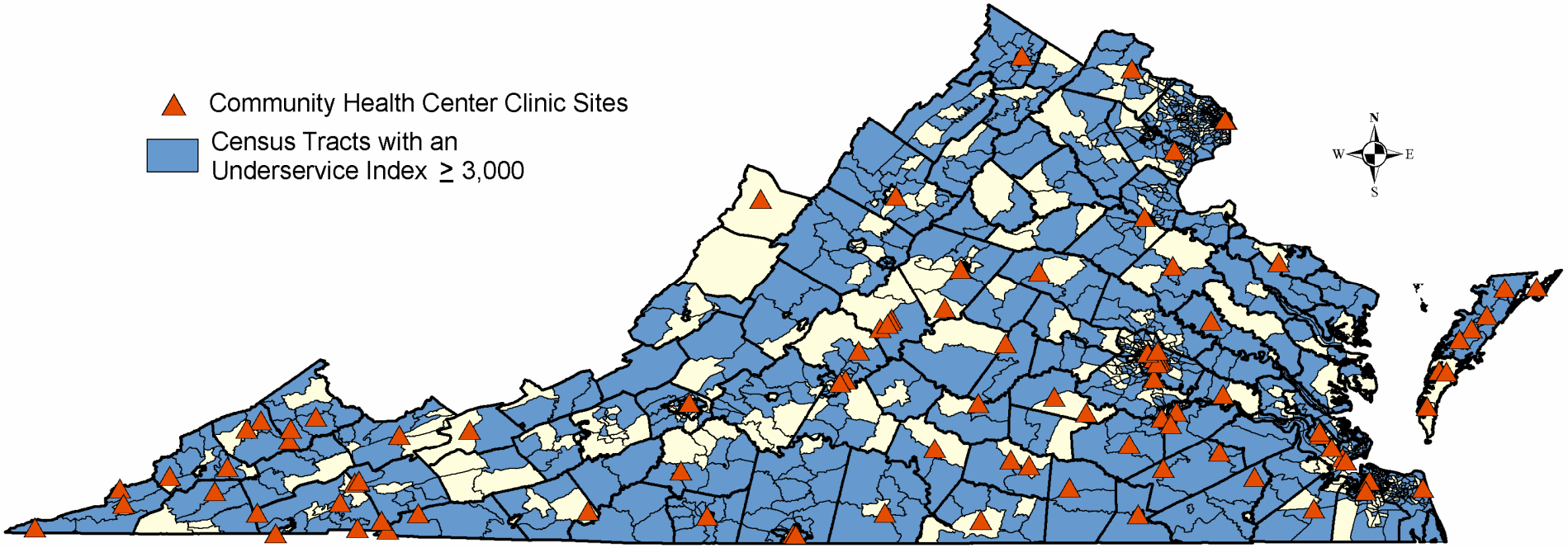
* The proposed designation criteria calculates an Underservice Index, which is composed of an adjusted population-to-provider ratio and a total score from various demographic, economic, and health status factors. For areas to be considered underserved, they must be defined as a rational service area, be limited (either by distance or overutilization) from contiguous primary care resources, and the Underservice Index must be equal to or greater than 3,000.

For more detailed discussion see: http://bhpr.hrsa.gov/shortage/hpsafrn022908.htm.

Impact Analysis I: Proposed Designation Rules

Underserved* Census Tracts in Virginia
Based on HRSA's Proposed Designation Criteria

4-08-08



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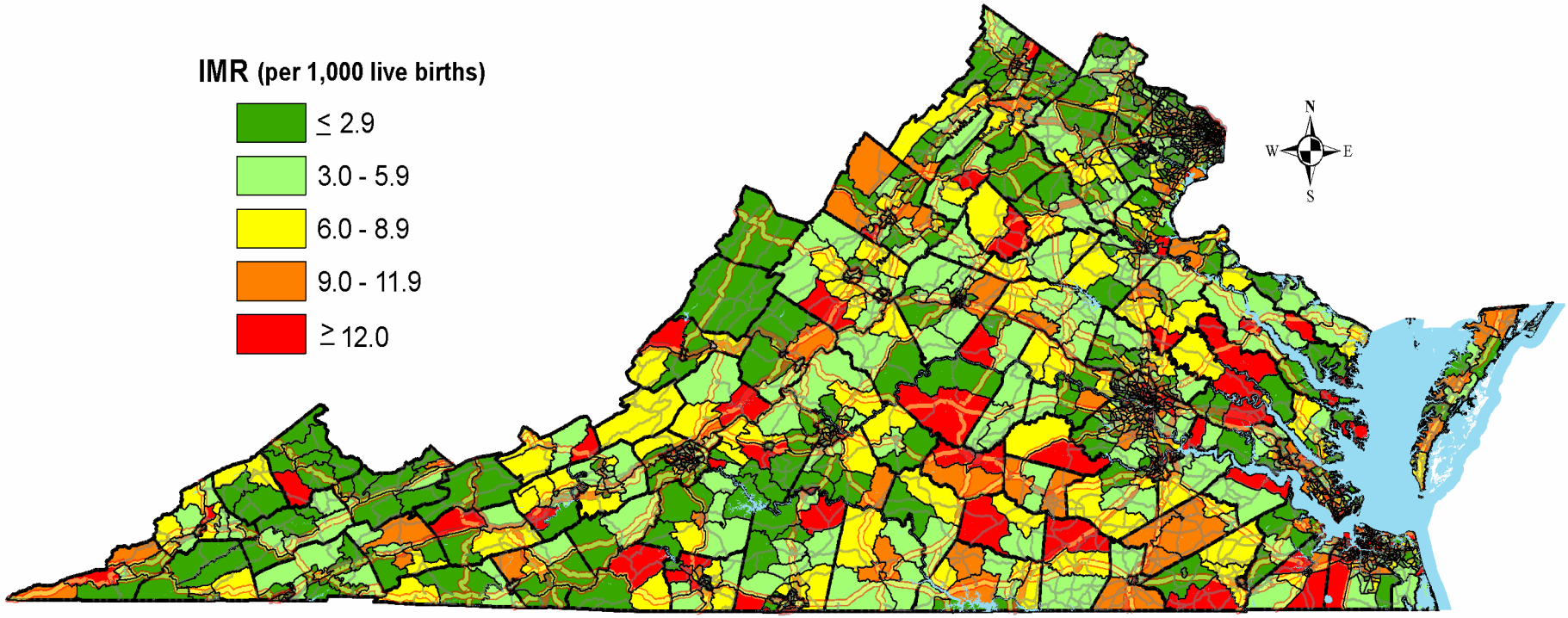
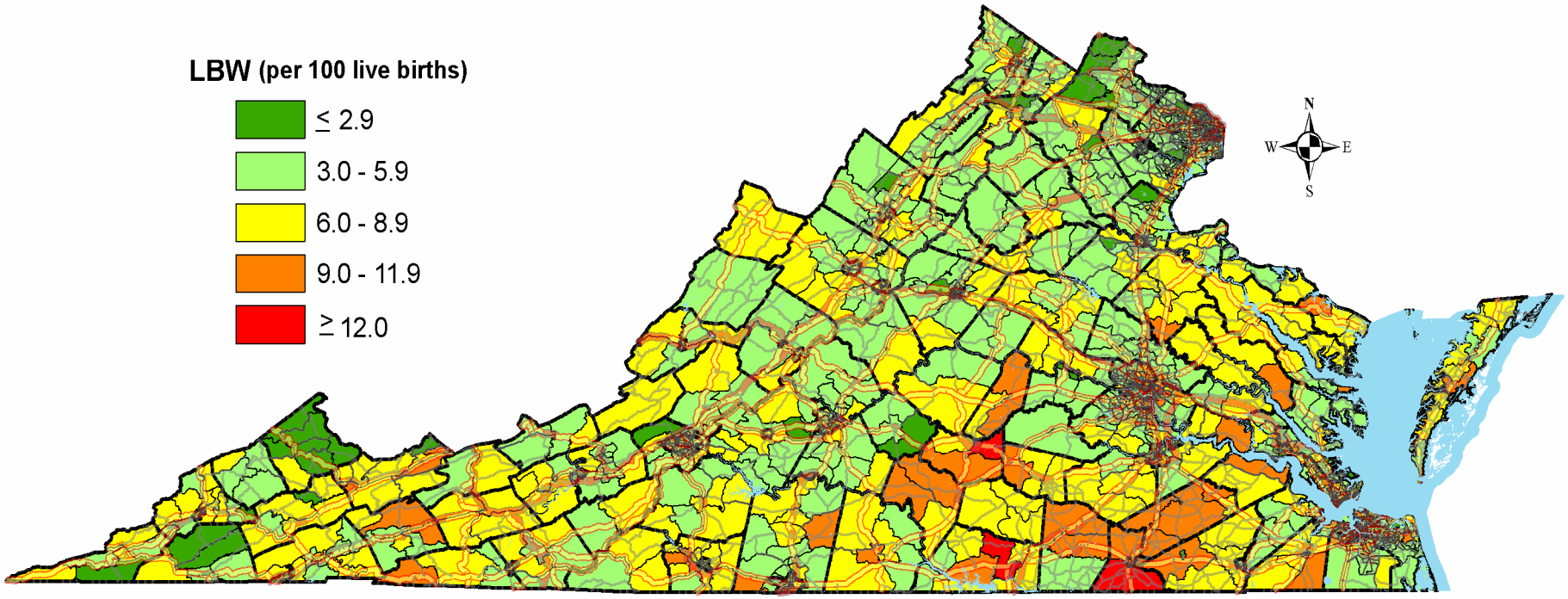
Infant Mortality Rate (IMR) by Census Tract, 1996-2005



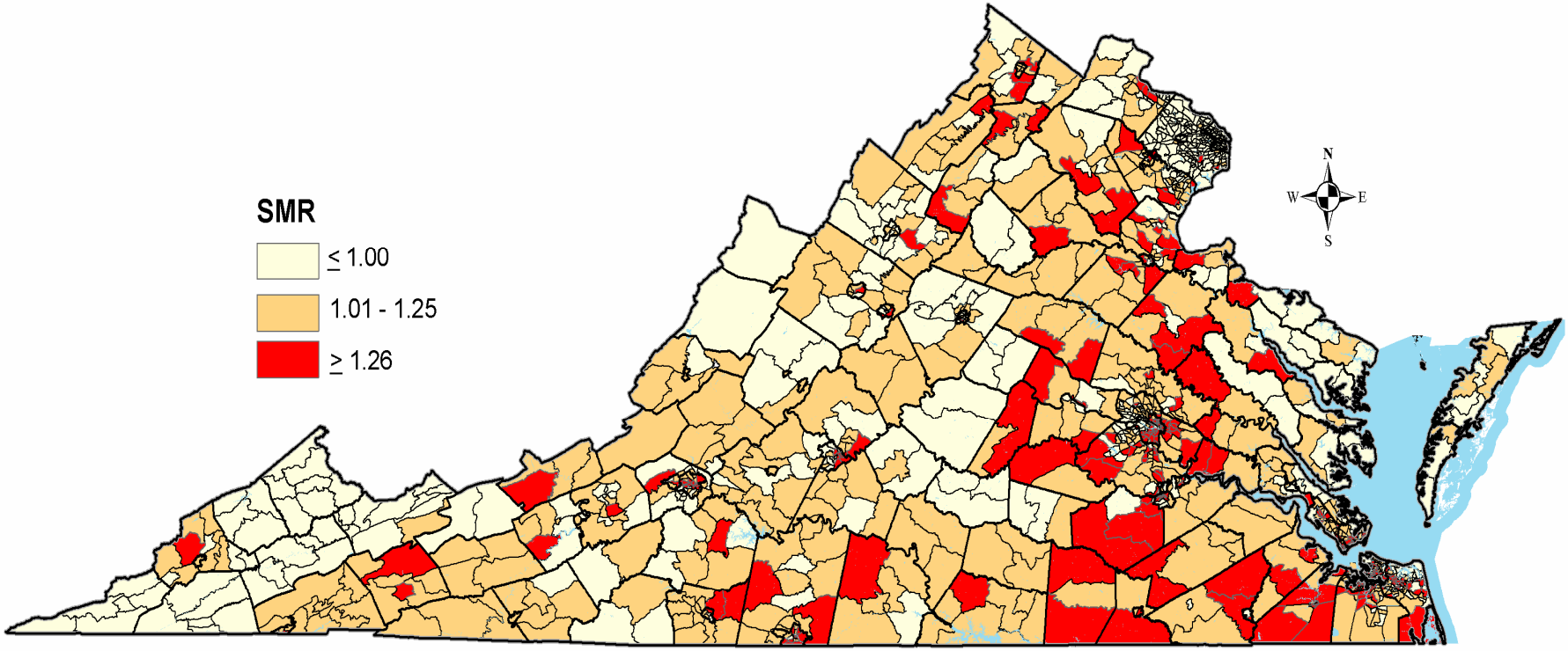
Source: VDH Vital Statistics, (1996-2005, geocoding error rate= 10%); Data consists of singleton births for mothers aged 15-44 years.

Low-Birth Weight Rate (LBW) by Census Tract, 1996-2005



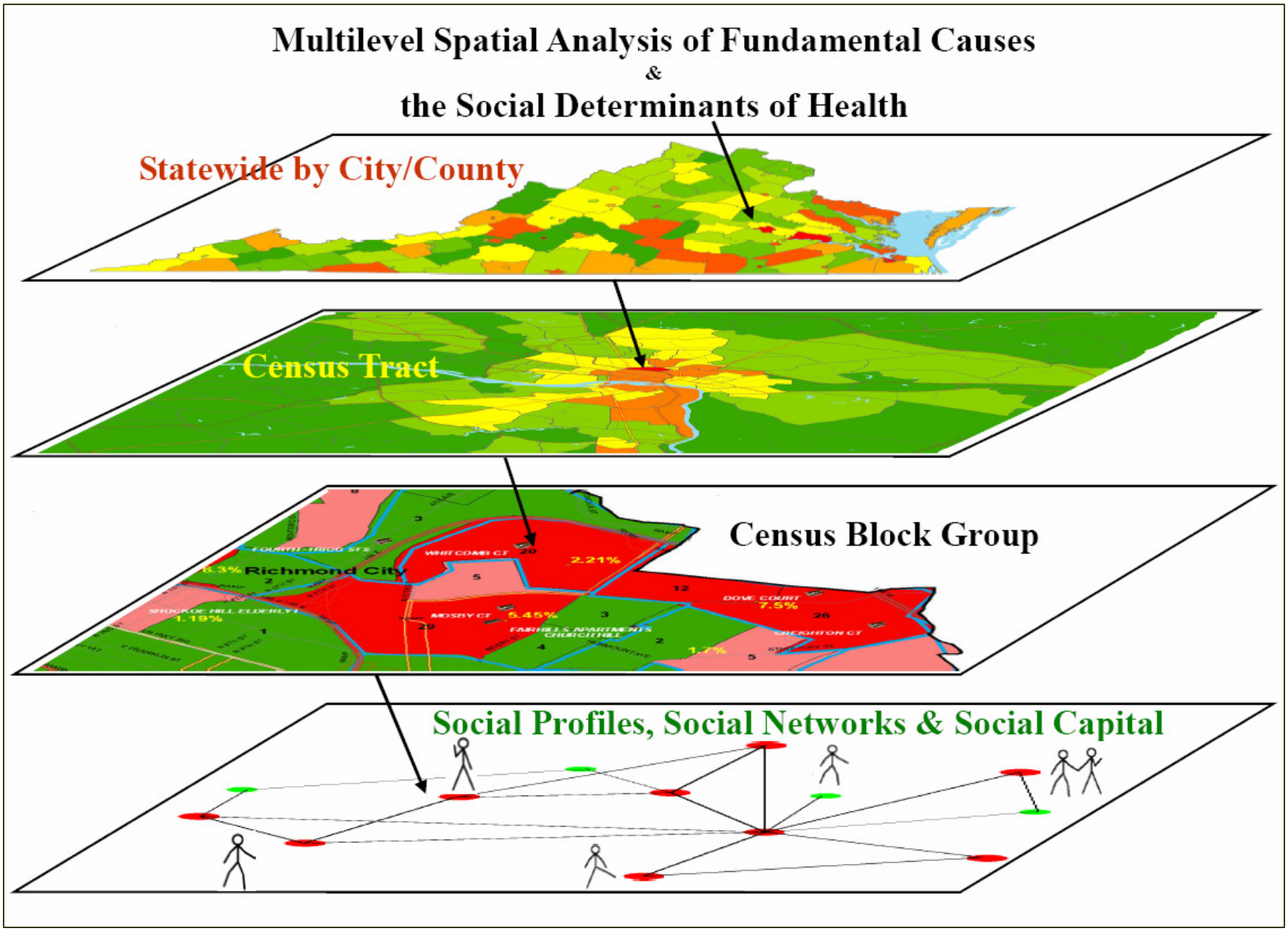
Source: VDH Vital Statistics, (1996-2005, geocoding error rate= 10%); Data consists of singleton births for mothers aged 15-44 years.

Standardized Mortality Ratio (SMR)* by Census Tract, 2001-2005



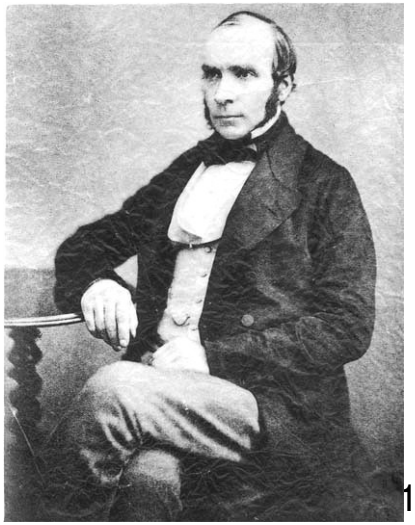
* SMR = observed/expected death ratio. Sources: Observed deaths-- (VDH Vital Statistics, 2001-2005; geocoding error rate= 10%);
Expected deaths-- (US Census 2000, Summary File 1, P12) and (CDC- National Center for Health Statistics, 2005 age-specific death rates).

Multi-Level Analysis
&
Reframing the Question

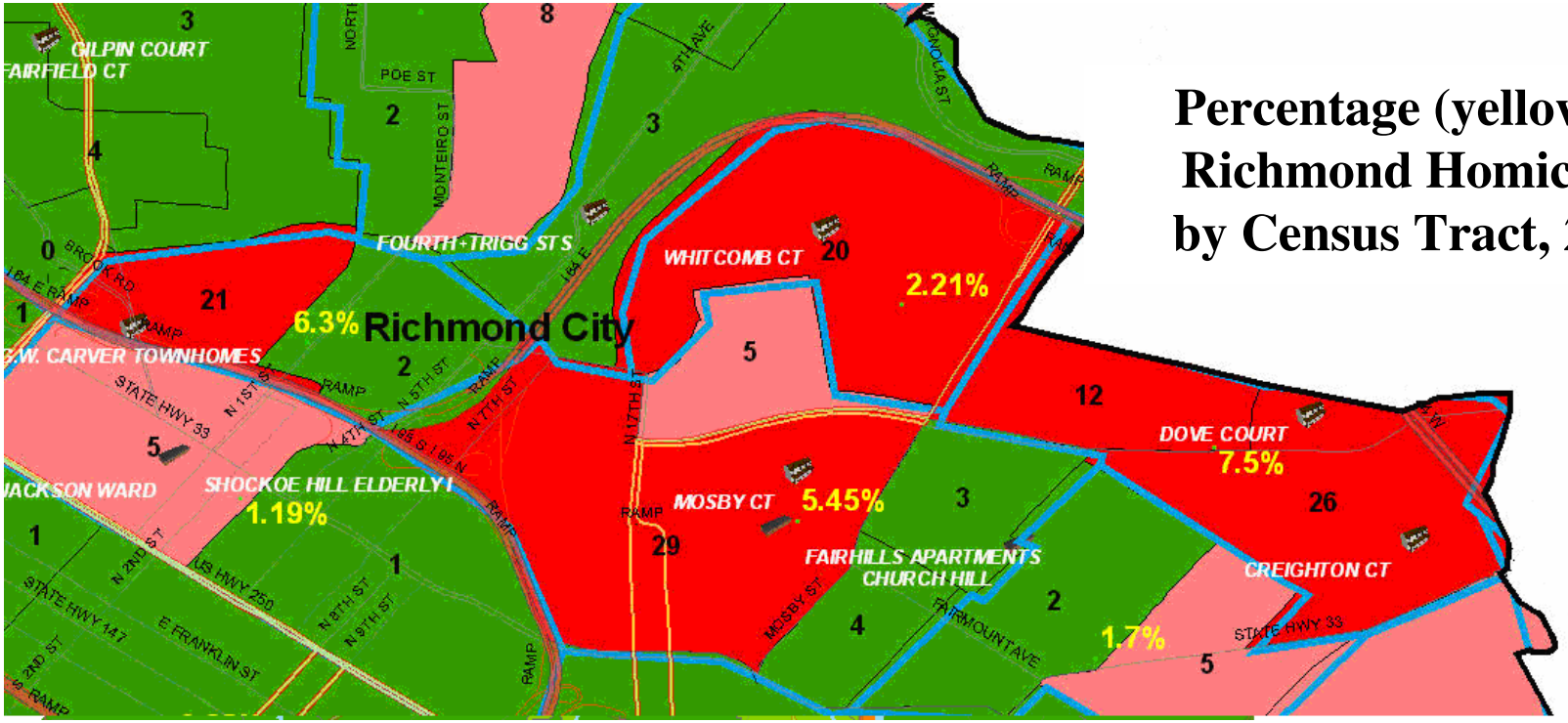

Multilevel Spatial Analysis of Fundamental Causes
&
the Social Determinants of Health
Statewide by City/County
Census Tract
Census Block Group
Richmond City
Social Profiles, Social Networks & Social Capital

John Snow, Father of Spatial Epidemiology

Map of Cholera Epidemic
1854



Richmond, Virginia
Infant Deaths by Census Block Group, 1990-2005

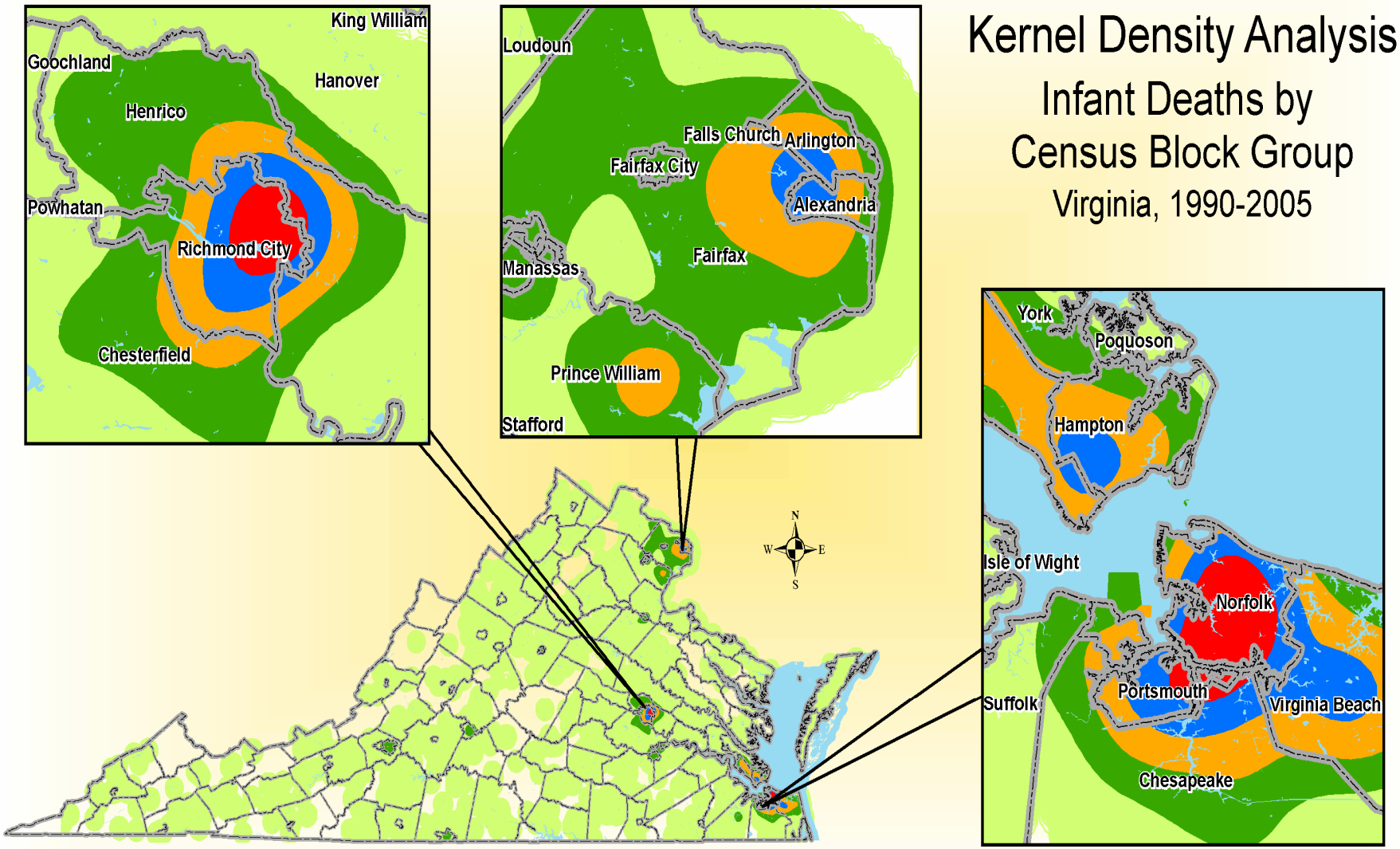


Percentage (yellow) of Richmond Homicides by Census Tract, 2007

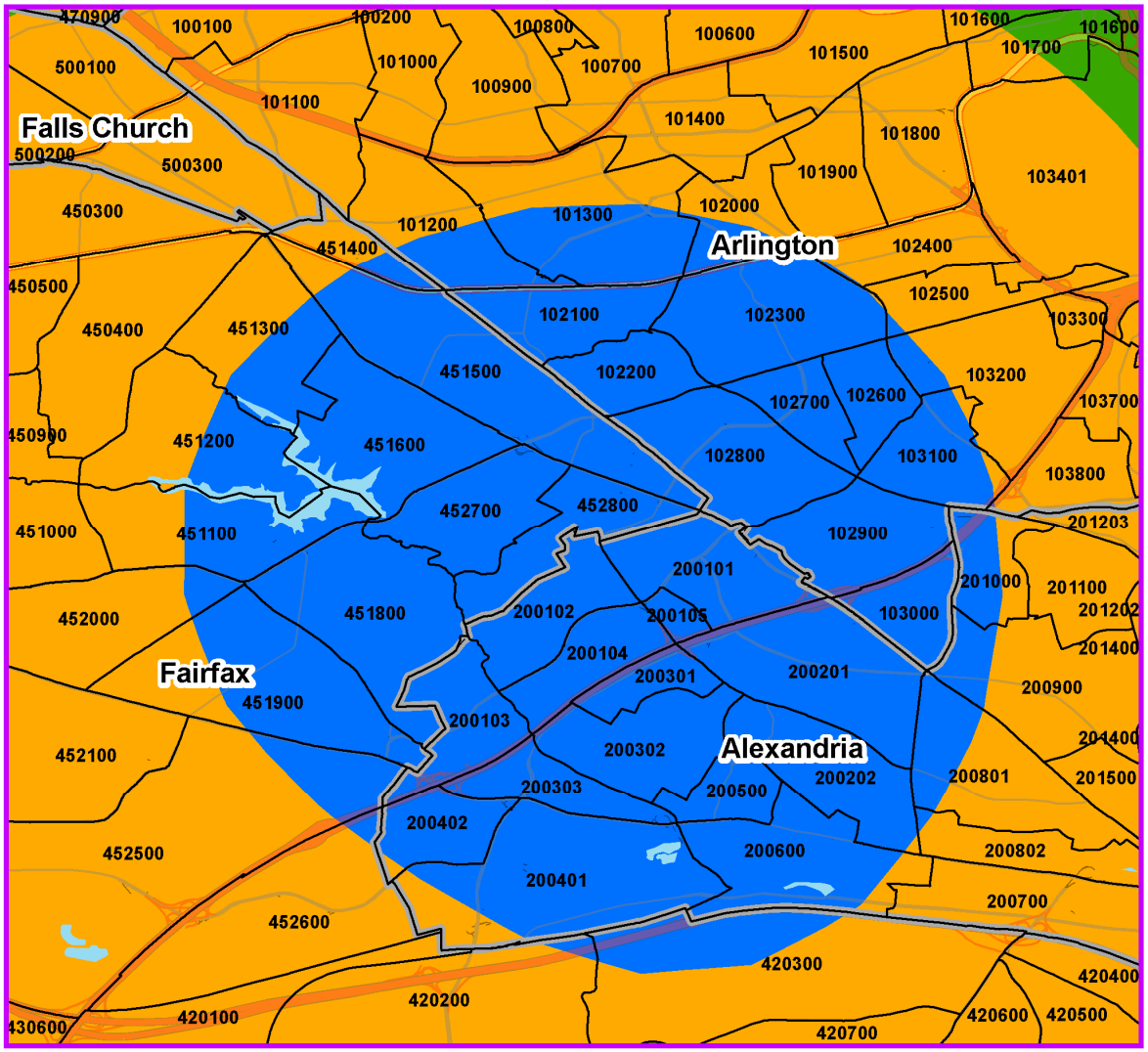
Kernel Density Analysis

Infant Deaths by Census Block Group

Virginia, 1990-2005

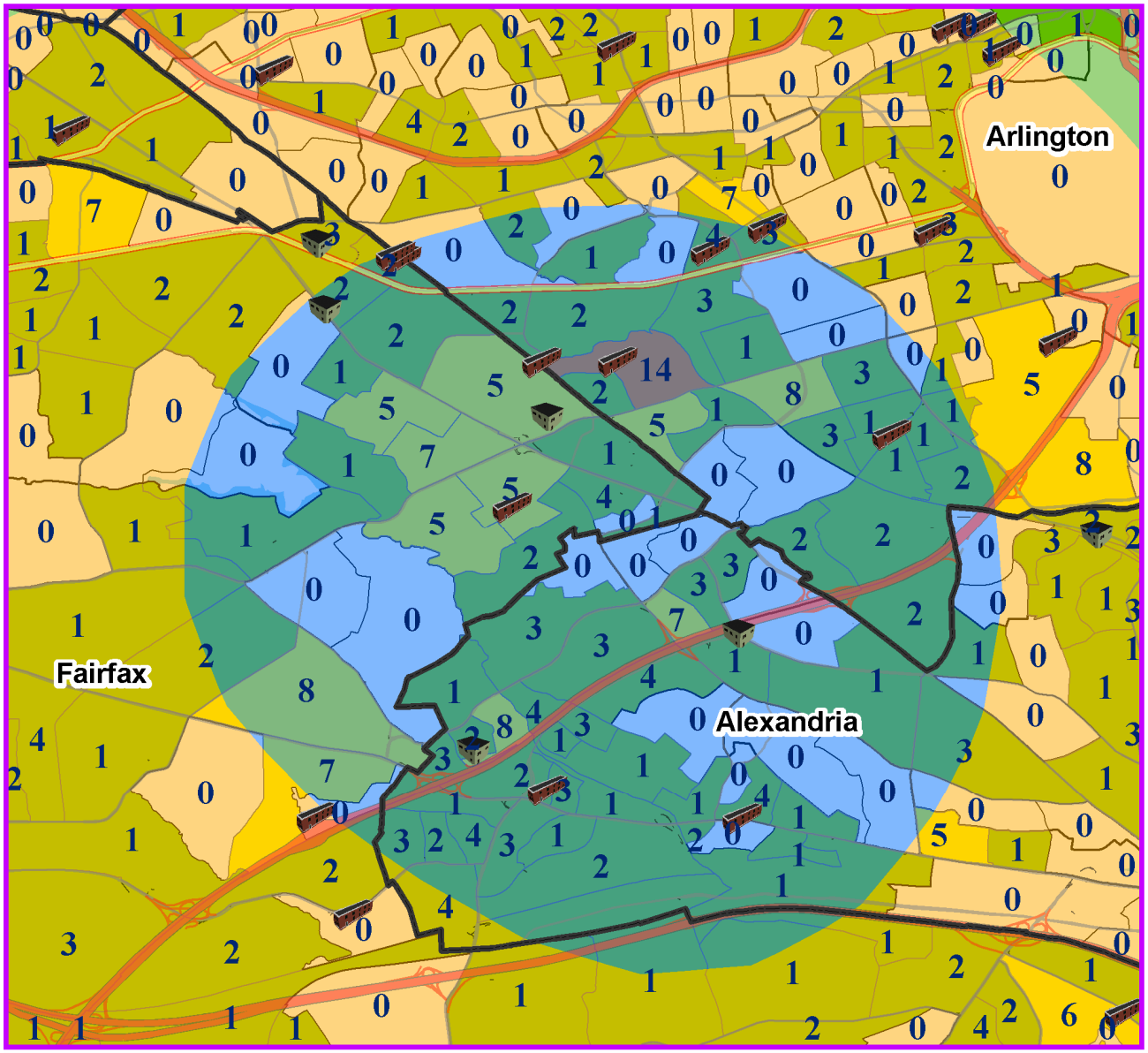


NOVA Census Tracts with High Infant Mortality



Source: VDH Vital Statistics, 1990-2005.

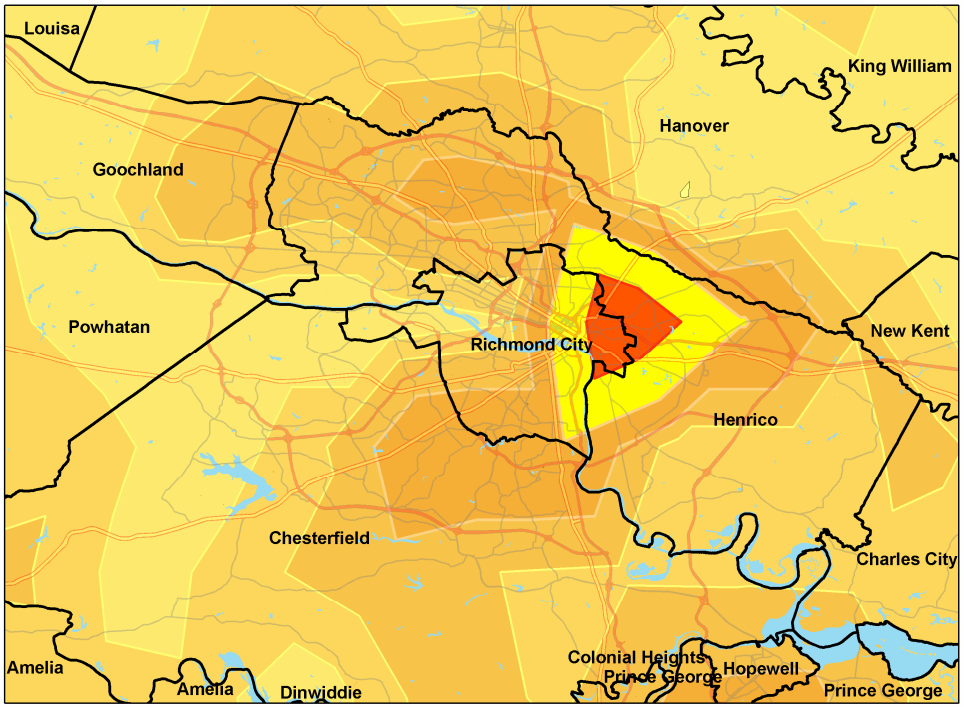
NOVA Infant Deaths per Census Block Group



Source: VDH Vital Statistics, 1990-2005.

Predictive Kriging Analysis

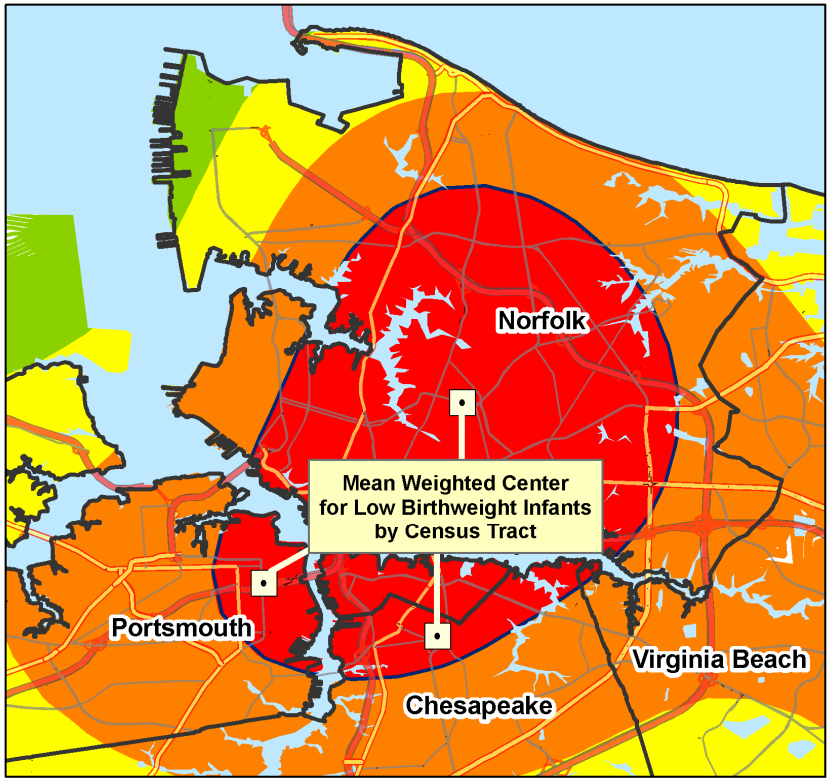
Infant Deaths by Block Group



Source: VDH Vital Statistics, 1990-2005.

Kernel Density Analysis

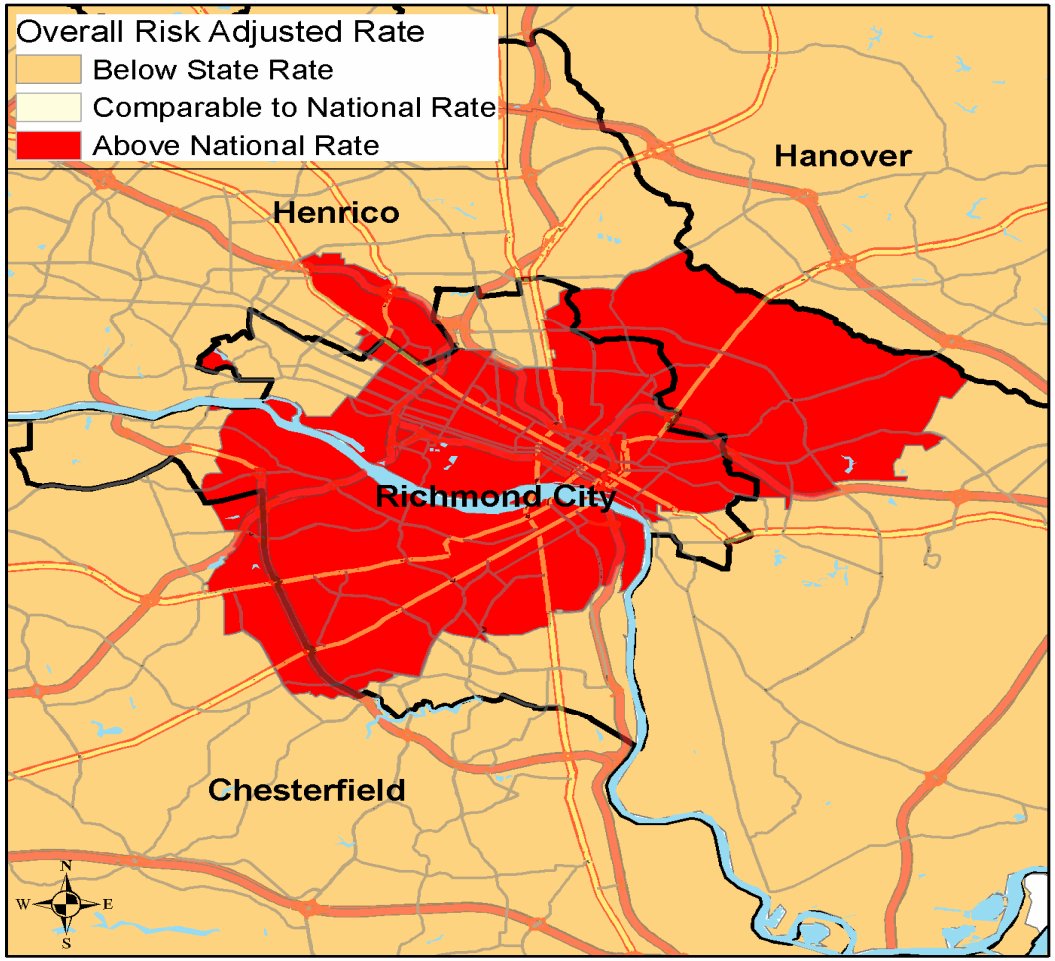
Low Birth-weight Infants based on Census Tract Data with Optimum Locations for Clinics



Source: VDH Vital Statistics, 1996-2005.

Prevention Quality Indicator – Overall Composite

(Includes all PQIs except Low Birth Weight and Perforated Appendix)
Based on Virginia Hospital Discharge Claims, VHI 2006

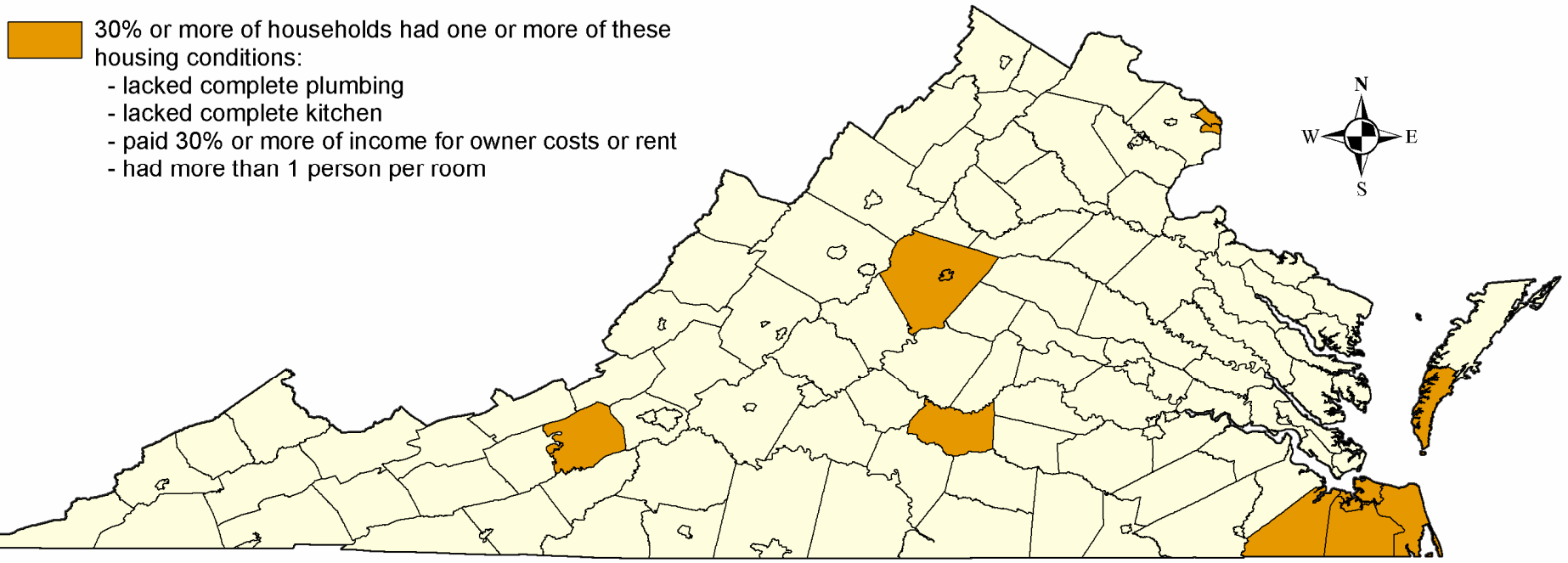


National Rate (per 1,000*) 18.79**; State Rate (per 1,000*) 14.68.

*Population - 18 years or older. State rates calculated by zip code.
**Source: Nationwide Inpatient Sample, 2004, AHRQ Website: http://www.qualityindicators.ahrq.gov

Analysis of Spatially Referenced Data:
Levels of Aggregation

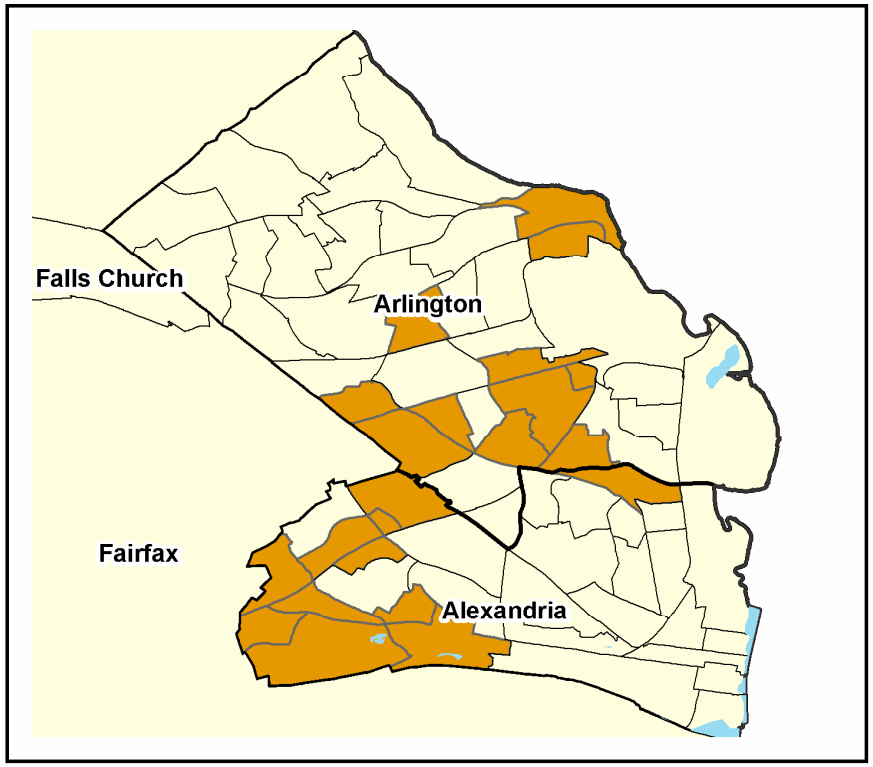
Housing Stress
Virginia Counties



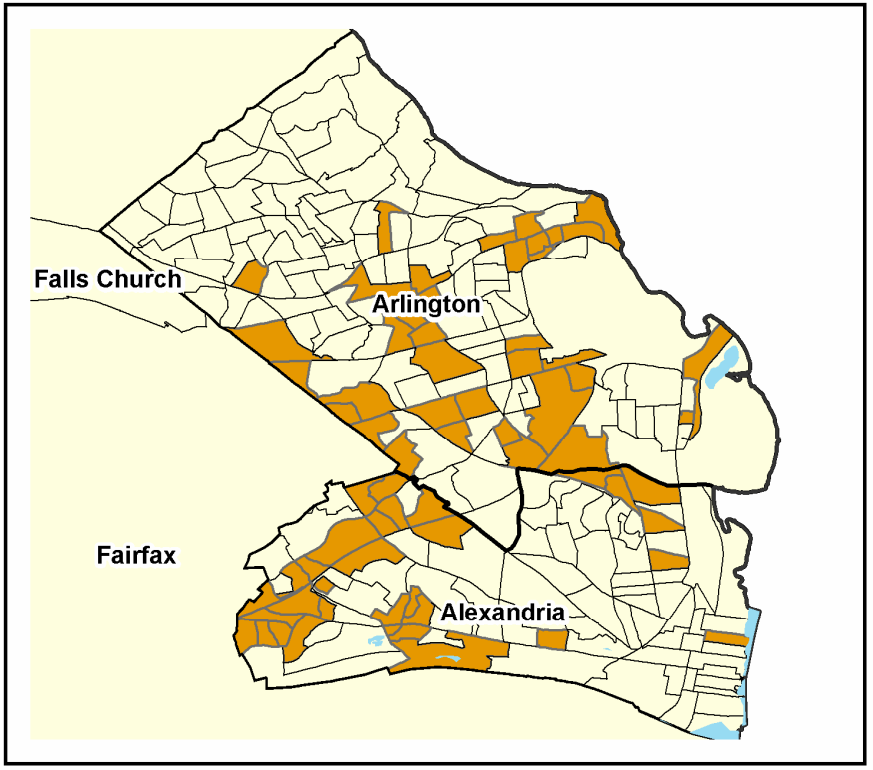
Source: United States Department of Agriculture: Economic Research Service, 2004 County Typologies.

Housing Stress
Arlington County and Alexandria City

Census Tract Level



Block Group Level

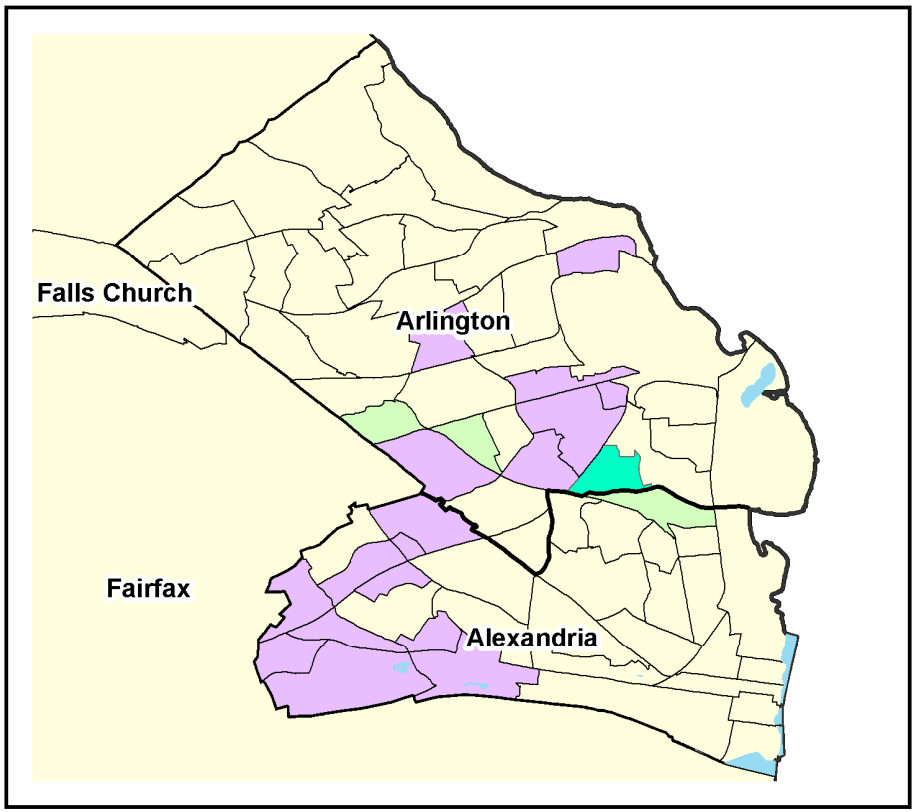


Source: Census 2000, SF3; H20, H47, H50, H73, H97.

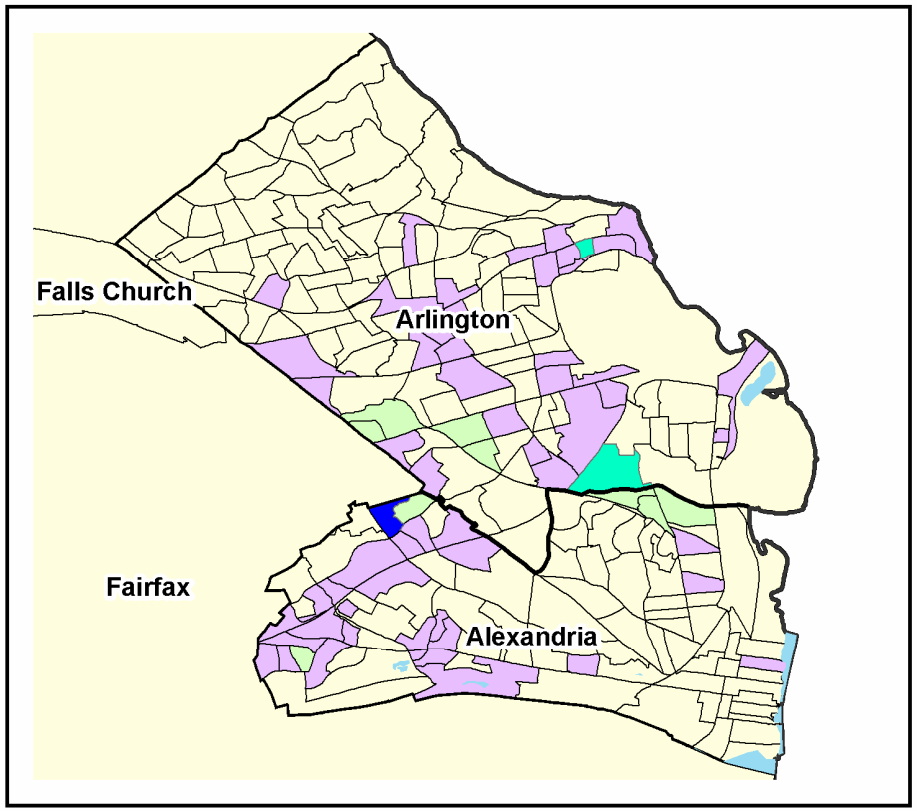
30% or more of households:

- had more than 1 person per room
- paid 30% or more of income for owner costs or rent
- had more than 1 person per room AND paid 30% or more of income for owner costs or rent
- lacked complete kitchen AND paid 30% or more of income for owner costs or rent

Census Tract Level



Block Group Level

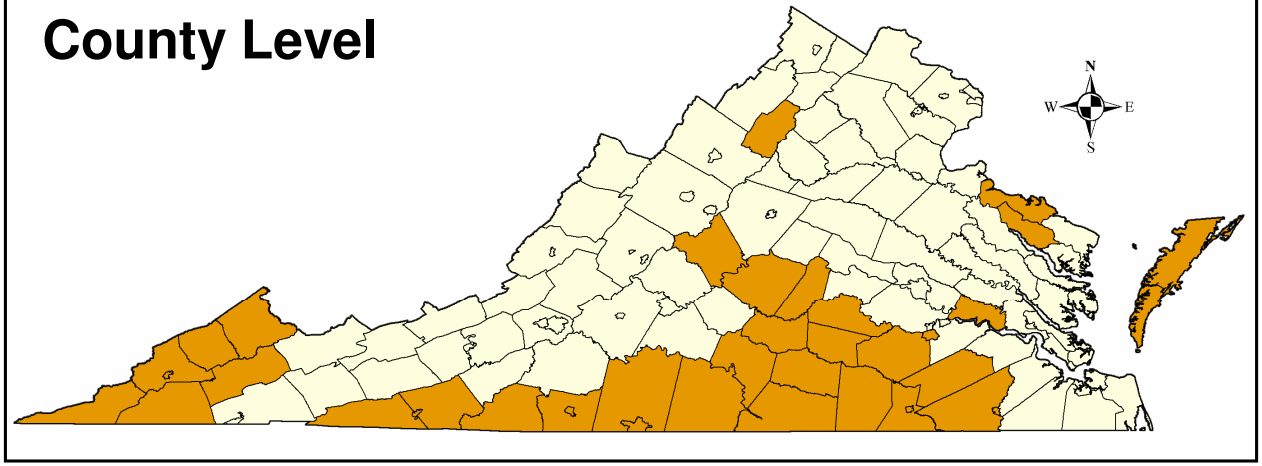


Source: Census 2000, SF3; H20, H47, H50, H73, H97.

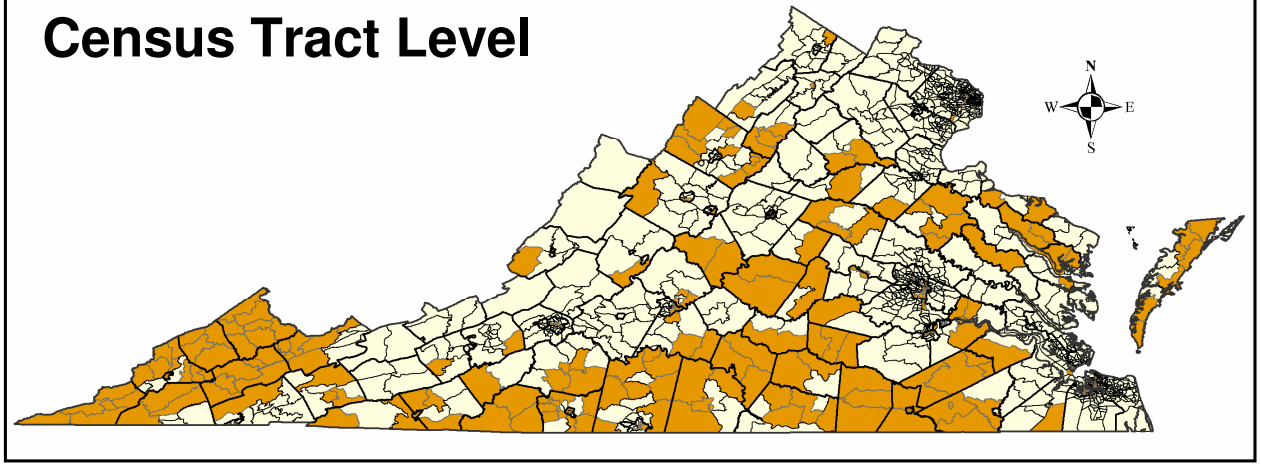
Low Education in Virginia

25% or more of residents 25-64 years old had neither a high school diploma nor GED

County Level



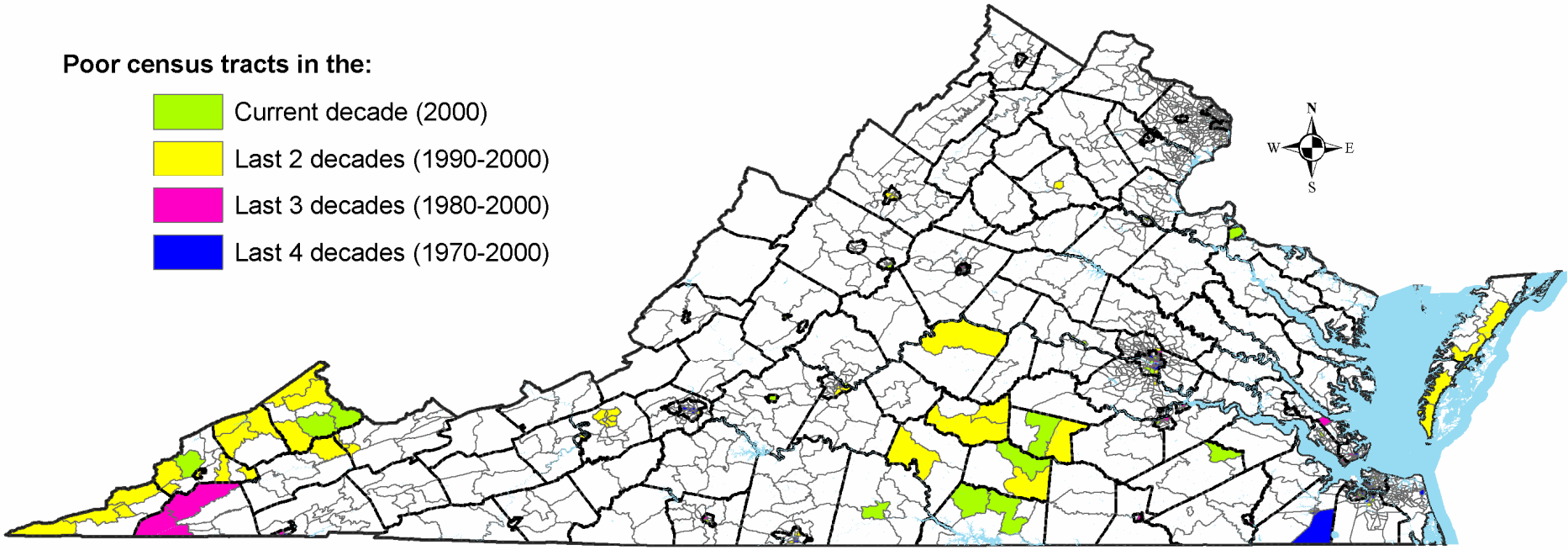
Census Tract Level



Source: United States Department of Agriculture: Economic Research Service, 2004 County Typologies; Census 2000, SF3-PCT25.

“Persistency” as a Social Variable

The History of Poor Census Tracts* in Virginia 1970-2000



* Poor census tracts--20 percent or more residents were below the federal poverty level as determined by the US Census.

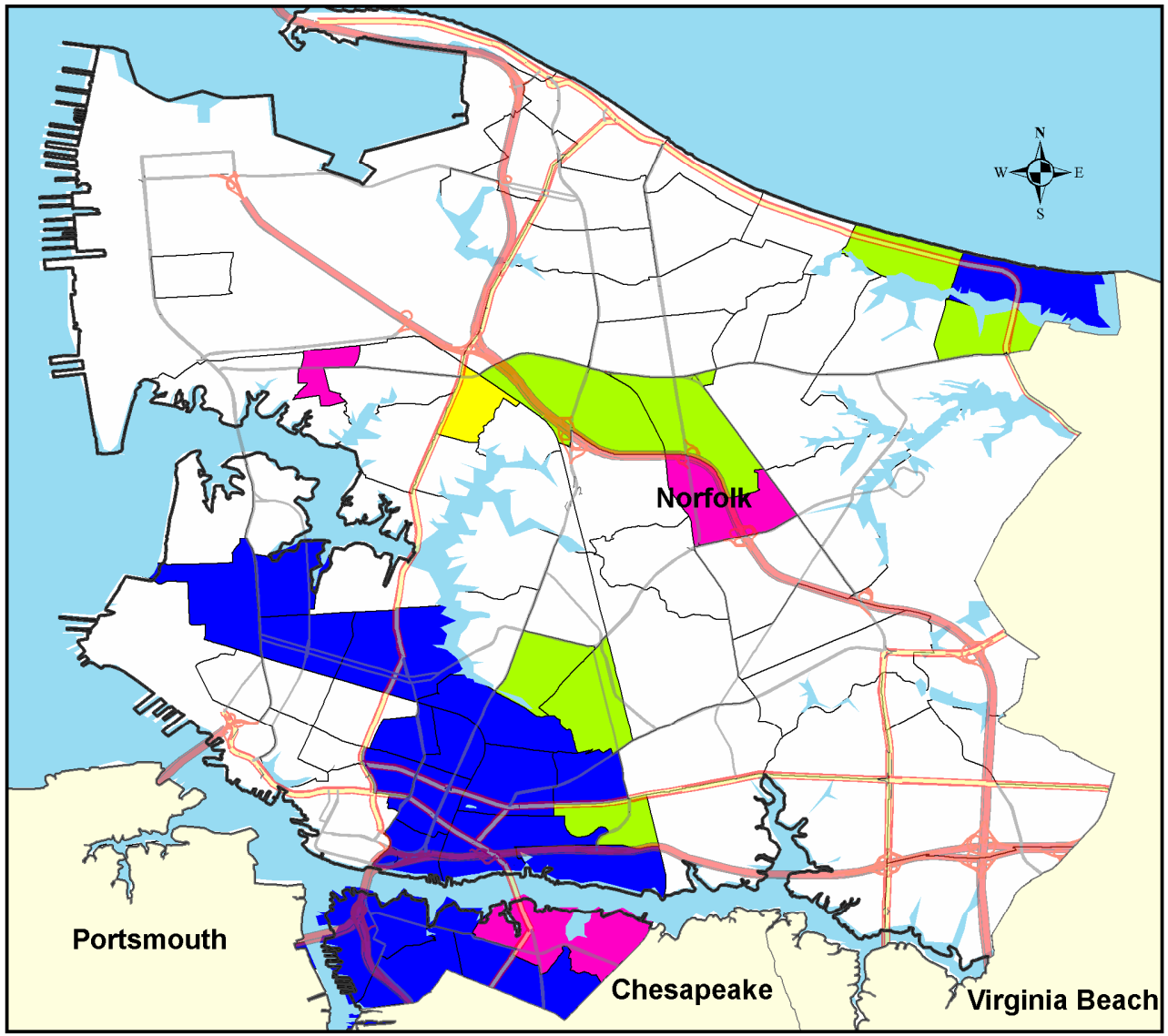
Source: Neighborhood Change Database: Geolytics, Inc. Neighborhood Change Database 1970-2000 Tract Data Long Form Release 1.1 [CD-ROM]. Brunswick, NJ: Geolytics, Inc. [Producer and Distributor], 2004.
1970, 1980, and 1990 census tracts were normalized to Census 2000 boundaries.

The History of Poor Census Tracts* Norfolk City, Virginia 1970-2000

Poor census tracts in the:

- Current decade (2000)
- Last 2 decades (1990-2000)
- Last 3 decades (1980-2000)
- Last 4 decades (1970-2000)

* Poor census tracts--20 percent or more residents were below the federal poverty level as determined by the US Census. [1970, 1980, and 1990 census tracts normalized to Census 2000 boundaries]



Source: Neighborhood Change Database: Geolytics, Inc. Neighborhood Change Database 1970-2000 Tract Data Long Form Release 1.1[CD-ROM]. Brunswick, NJ: Geolytics, Inc. [Producer and Distributor], 2004.

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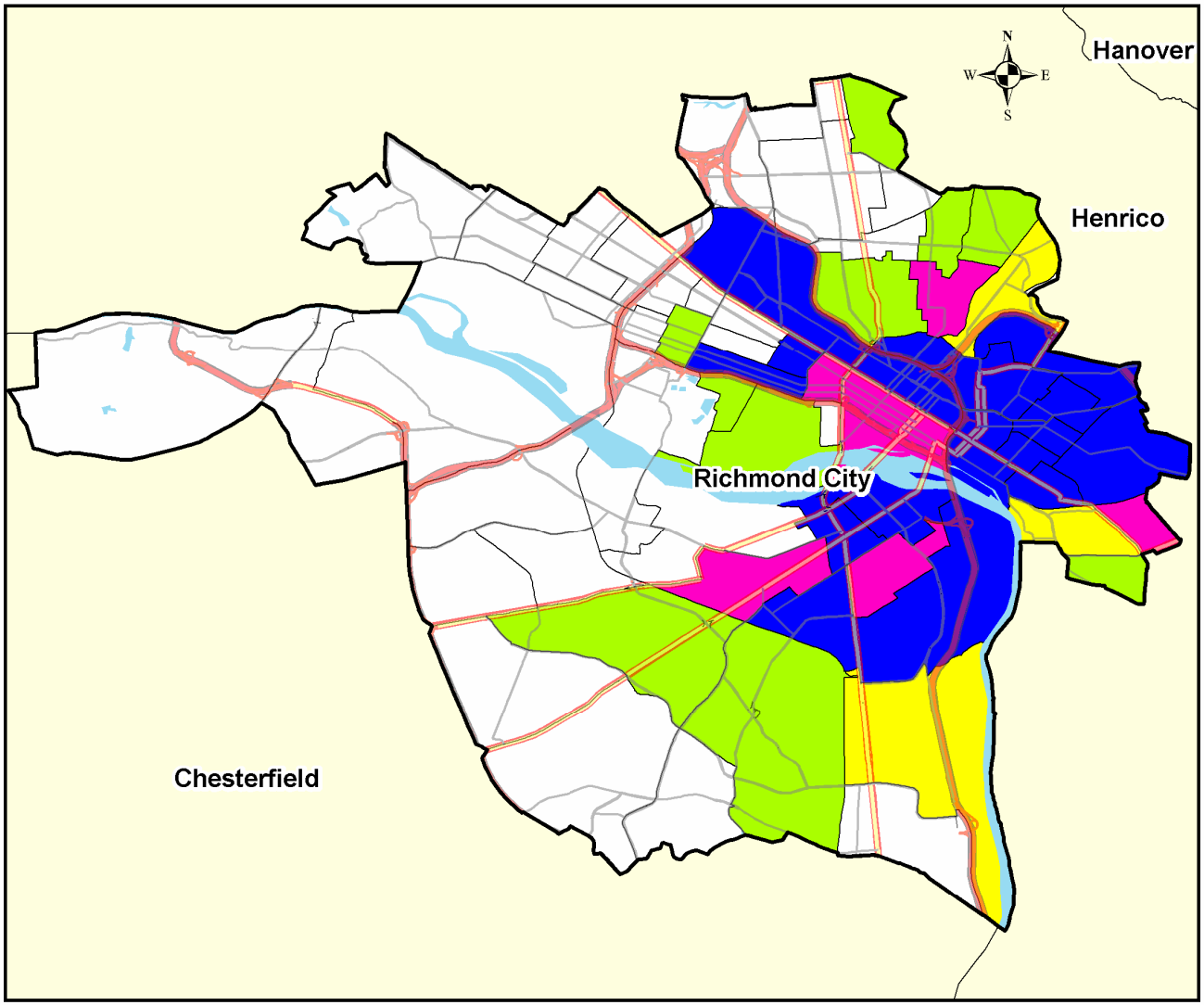


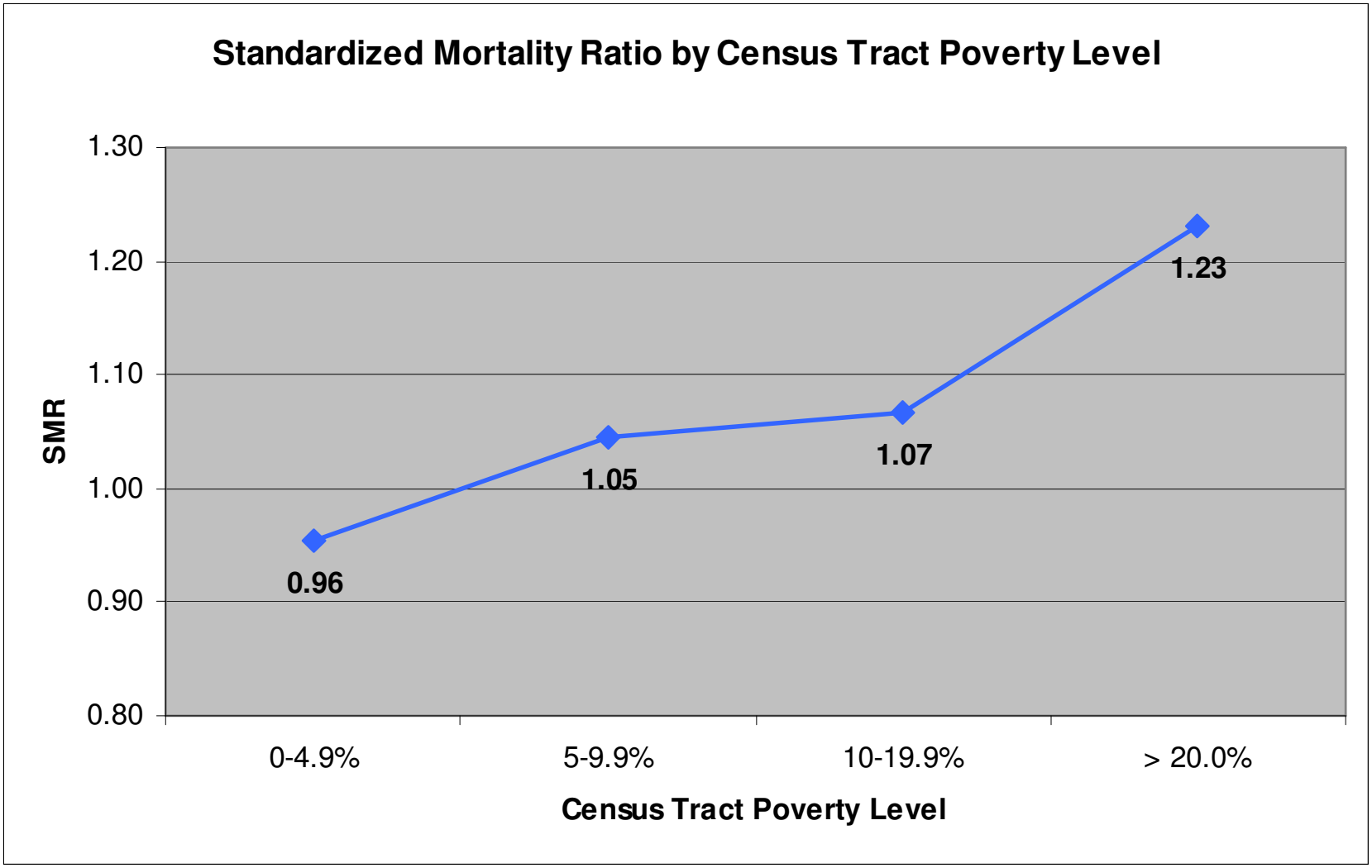
Source: Neighborhood Change Database: Geolytics, Inc. Neighborhood Change Database 1970-2000 Tract Data Long Form Release 1.1[CD-ROM]. Brunswick, NJ: Geolytics, Inc. [Producer and Distributor], 2004.

Analysis of Spatially Referenced Data:
Locational Analysis

Distribution of Infant Deaths, by Race/Ethnicity* and Census Tract (CT) Poverty, 1996-2005

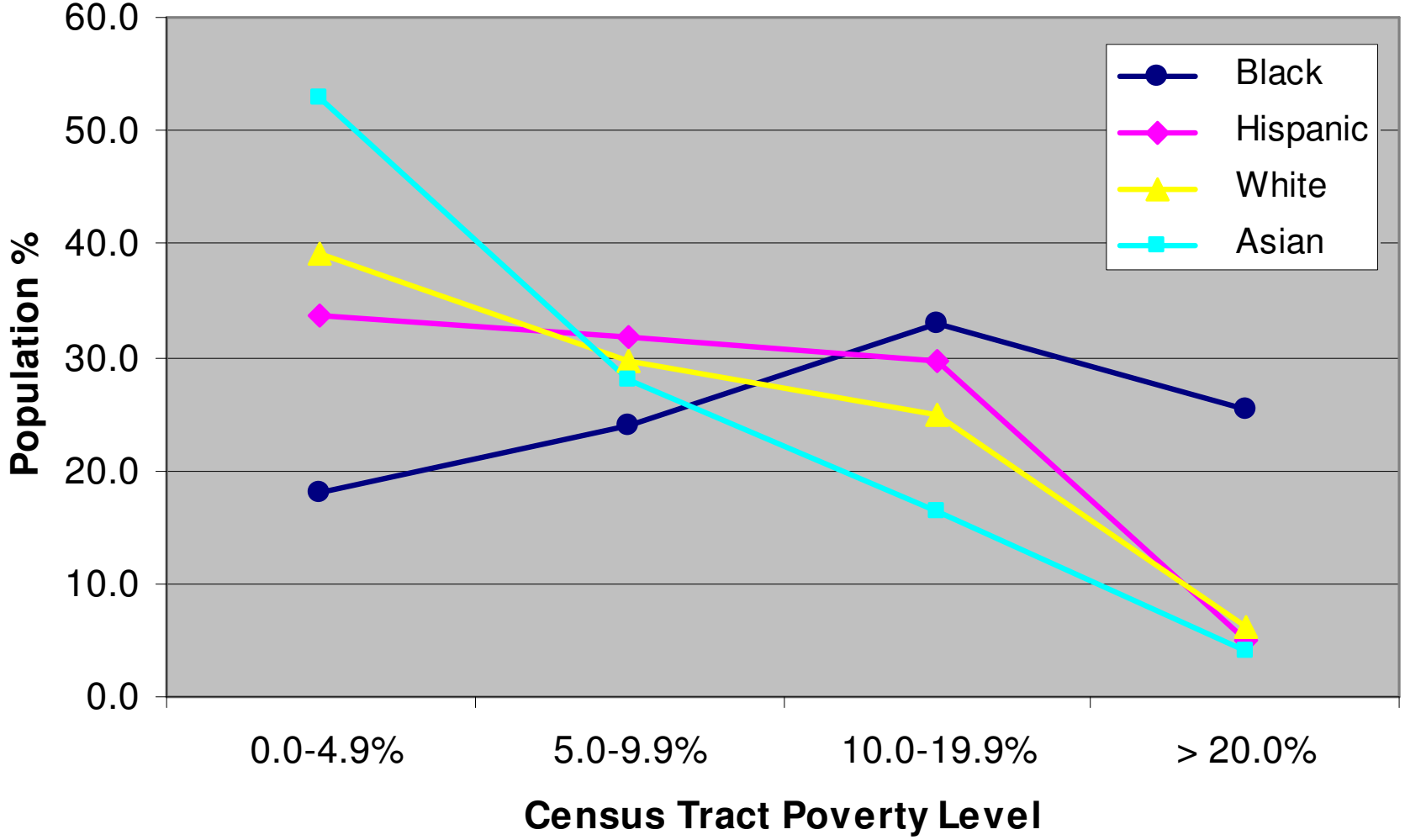
	Total			% Distribution by CT Poverty Level											
				0.0-4.9%			5.0-9.9%			10.0-19.9%			≥ 20.0%		
	births (n)	deaths (n)	IMR	births (n)	deaths (n)	IMR	births (n)	deaths (n)	IMR	births (n)	deaths (n)	IMR	births (n)	deaths (n)	IMR
Total	870,558	5,217	6.0	321,464	1333	4.1	252,239	1,395	5.5	211,169	1,496	7.1	85,686	993	11.6
White	541,796	2,442	4.5	233,427	823	3.5	164,142	772	4.7	119,704	675	5.6	24,523	172	7.0
Black	194,544	2,190	11.3	32,517	306	9.4	46,859	432	9.2	59,437	668	11.2	55,731	784	14.1
Hispanic	78,124	354	4.5	25,620	104	4.1	25,615	118	4.6	23,188	110	4.7	3,701	22	5.9
Other	56,094	231	4.1	29,900	100	3.3	15,623	73	4.7	8,840	43	4.9	1,731	15	8.7

* White and Black classifications are for non-Hispanic only. Rate calculations are based on birth and death data that geocoded correctly, 90%. Data consists of singleton births and mothers aged 15-44 years.

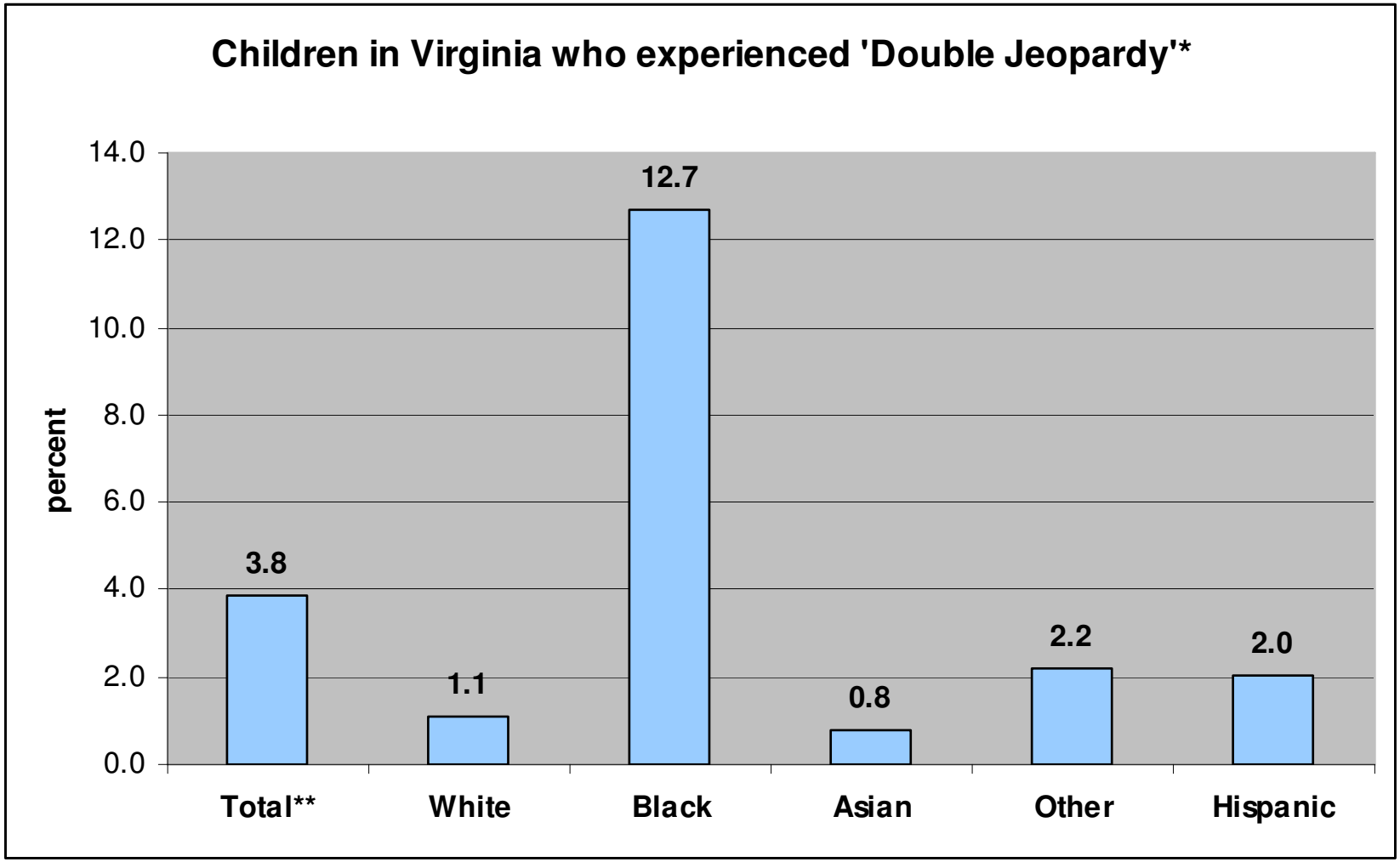


Observed death data were obtained from VDH Vital Statistics, (2001-2005, geocoding error rate= 10%); Expected death data were calculated from Census 2000 data (SF1, P12) and 2005 age-specific death rates (CDC- National Center for Health Statistics).

Distribution of Population by Race/Ethnicity and Census Tract Poverty Level, Virginia 2000



Source: US Census 2000; poverty (SF3, P87); race (SF1 P7); Hispanic ethnicity (SF1 P4).



Double Jeopardy describes children (under 18 years old) that live in poor families and in poor neighborhoods. Poor neighborhoods are defined as census tracts (CTs) with greater than 20.0% poverty. The racial categories include persons of Hispanic and non-Hispanic origin; 'Other' includes American Indian, Alaska Native, Native Hawaiian and other Pacific Islander, some other race alone, and two or more races. **Total number of children living below the federal poverty level reflects the sum of the four racial categories since Hispanic ethnicity could not be determined for each race. Source: Census 2000, SF3, P159.

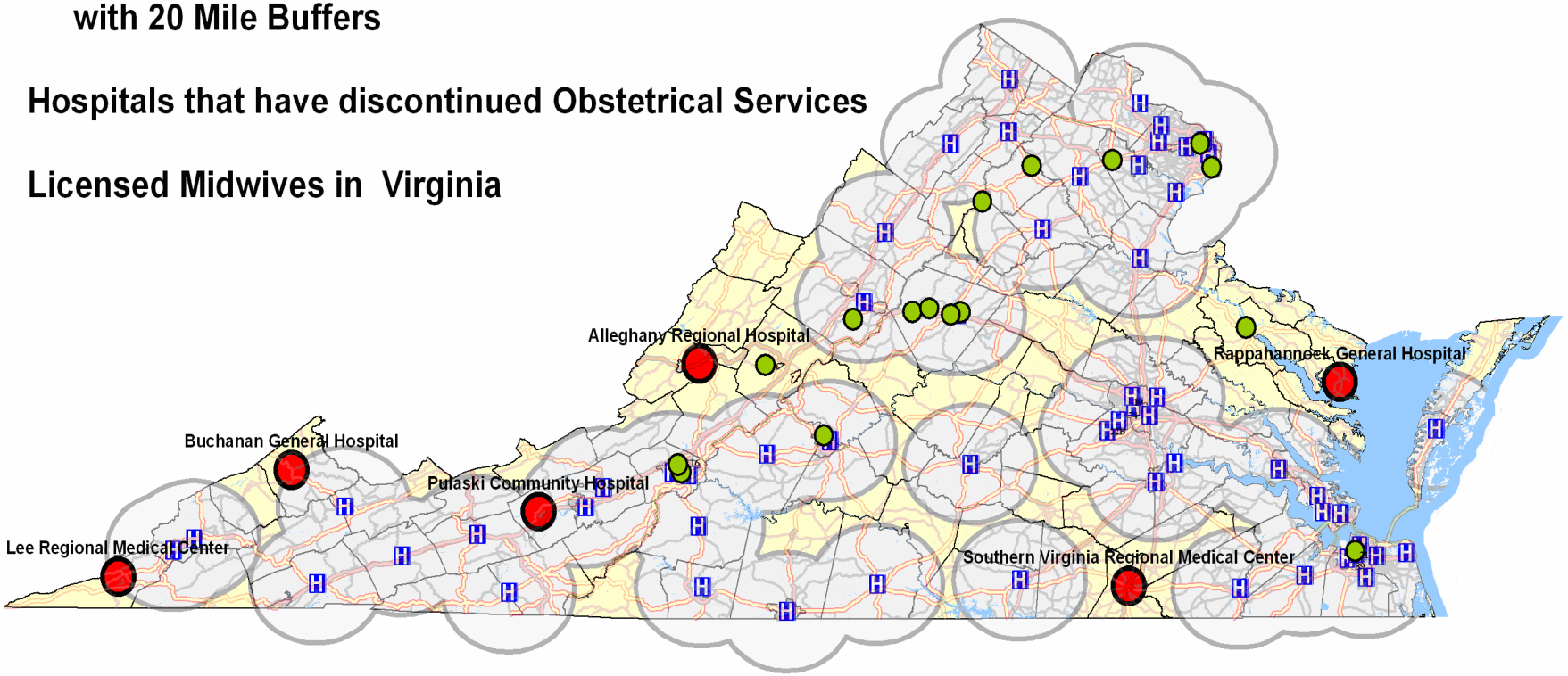
Analysis of Spatially Referenced Data:
Various Service Area Analyses

Access to Obstetrical Services in Virginia

Location of Virginia Hospitals with Obstetrical Services with 20 Mile Buffers

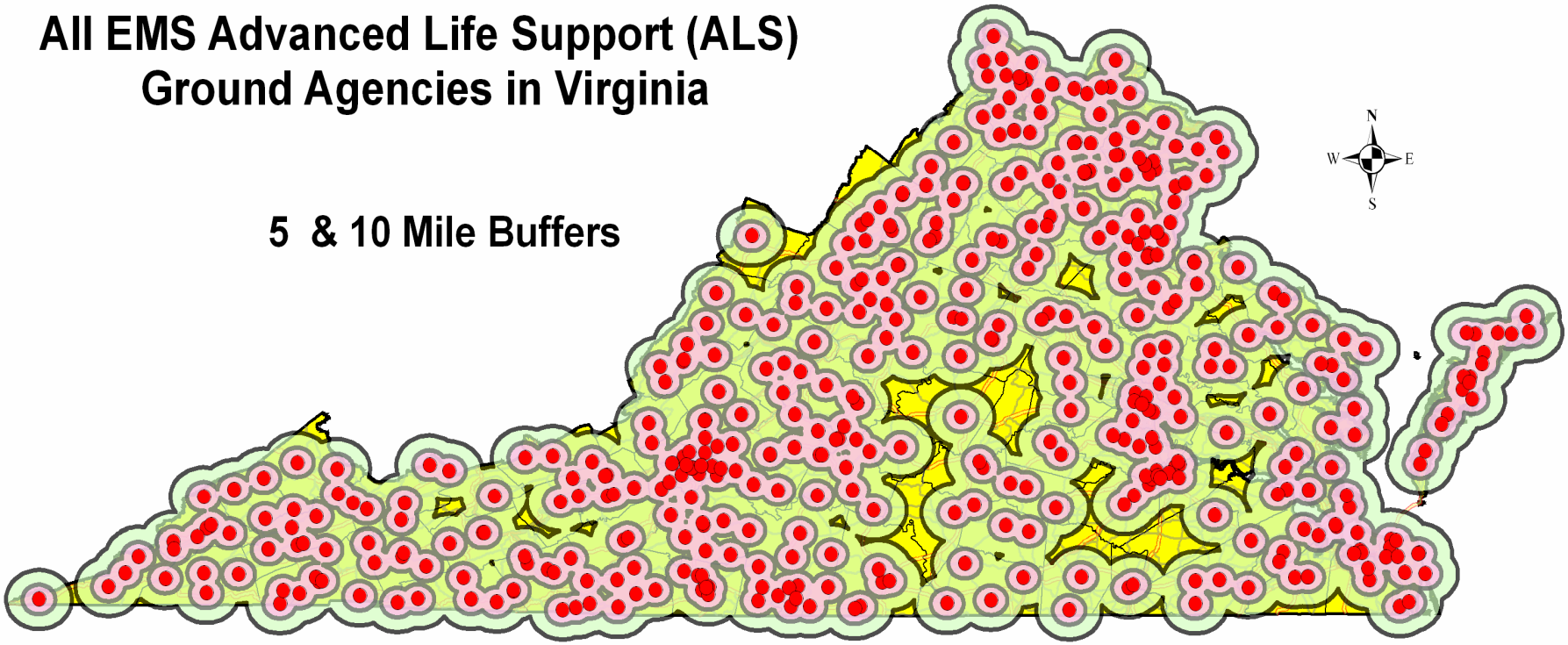
Hospitals that have discontinued Obstetrical Services

Licensed Midwives in Virginia



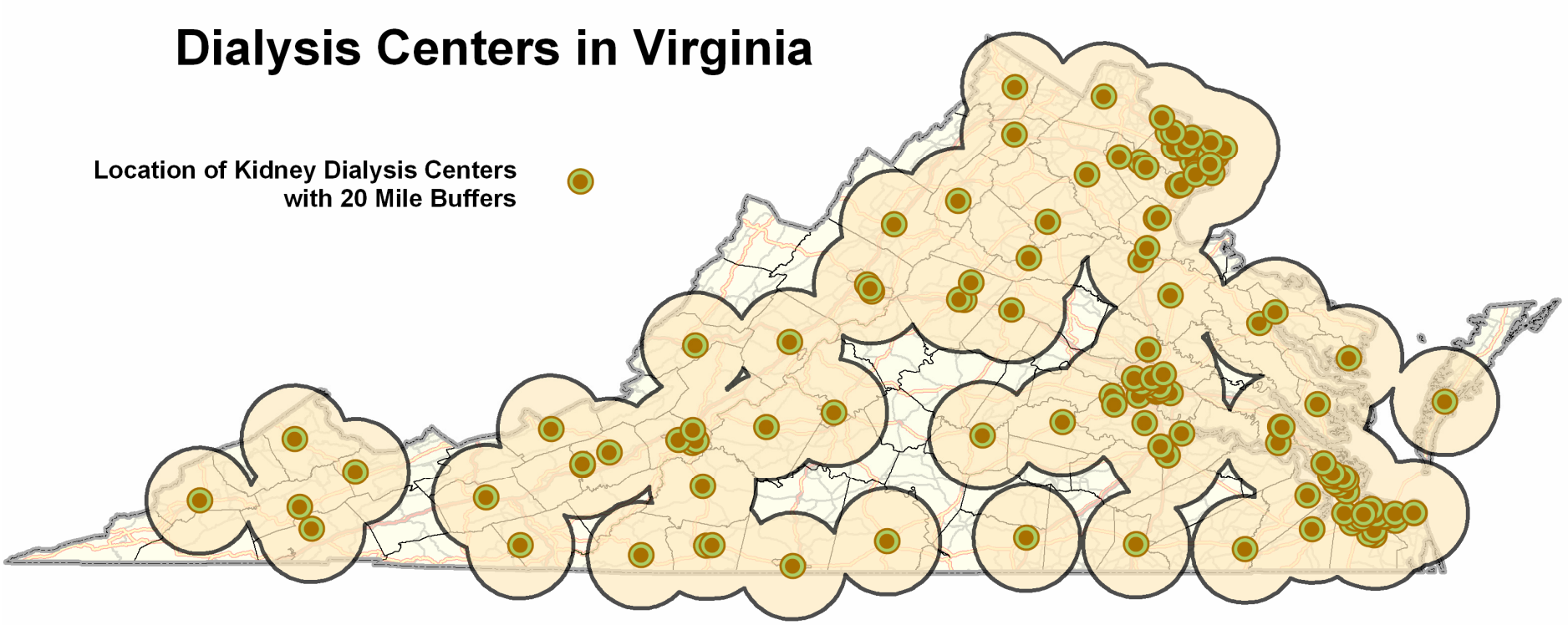
All EMS Advanced Life Support (ALS) Ground Agencies in Virginia

5 & 10 Mile Buffers

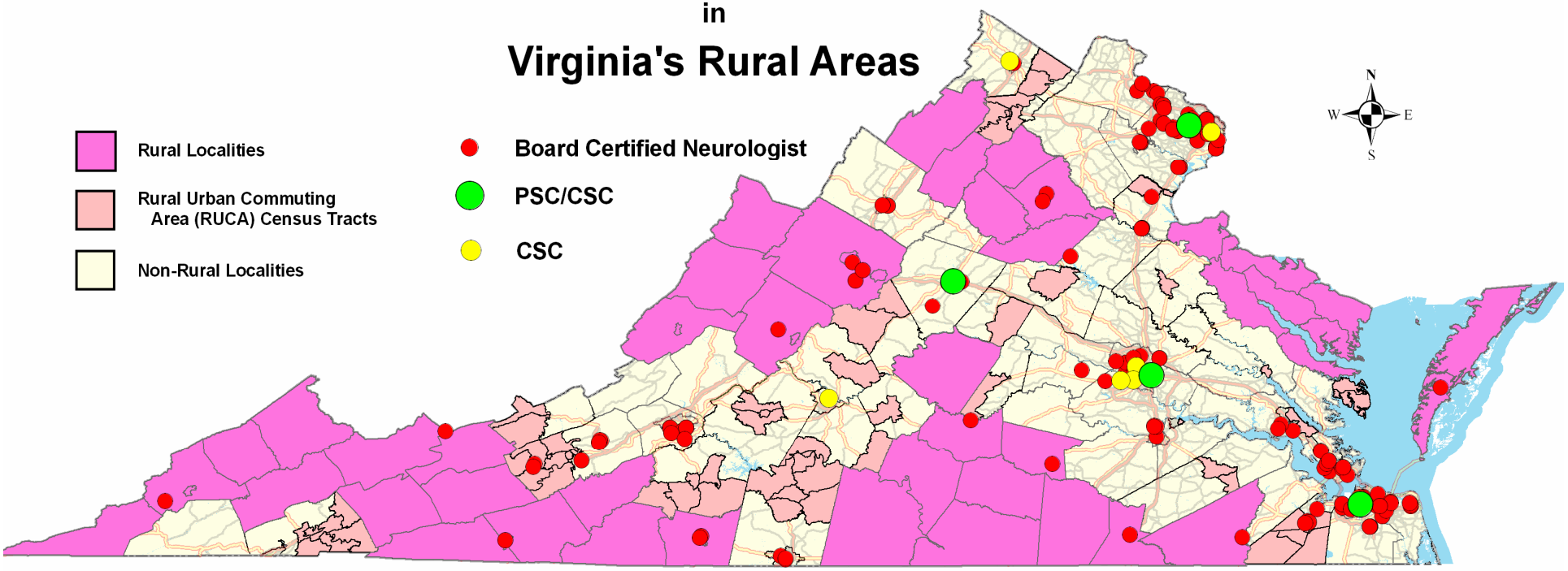


Virginia Population, Households and House Units Served by Advanced Life Support EMS						
	Population	% Population	Households	% Households	House Units	% House Units
Virginia	7,078,515	100.0	2,699,173	100.0	2,904,192	100.0
10 Mile Buffer	7,027,030	99.3	2,679,964	99.3	2,880,274	99.2
5 Mile Buffer	6,065,495	85.7	2,319,543	85.9	2,480,667	85.4

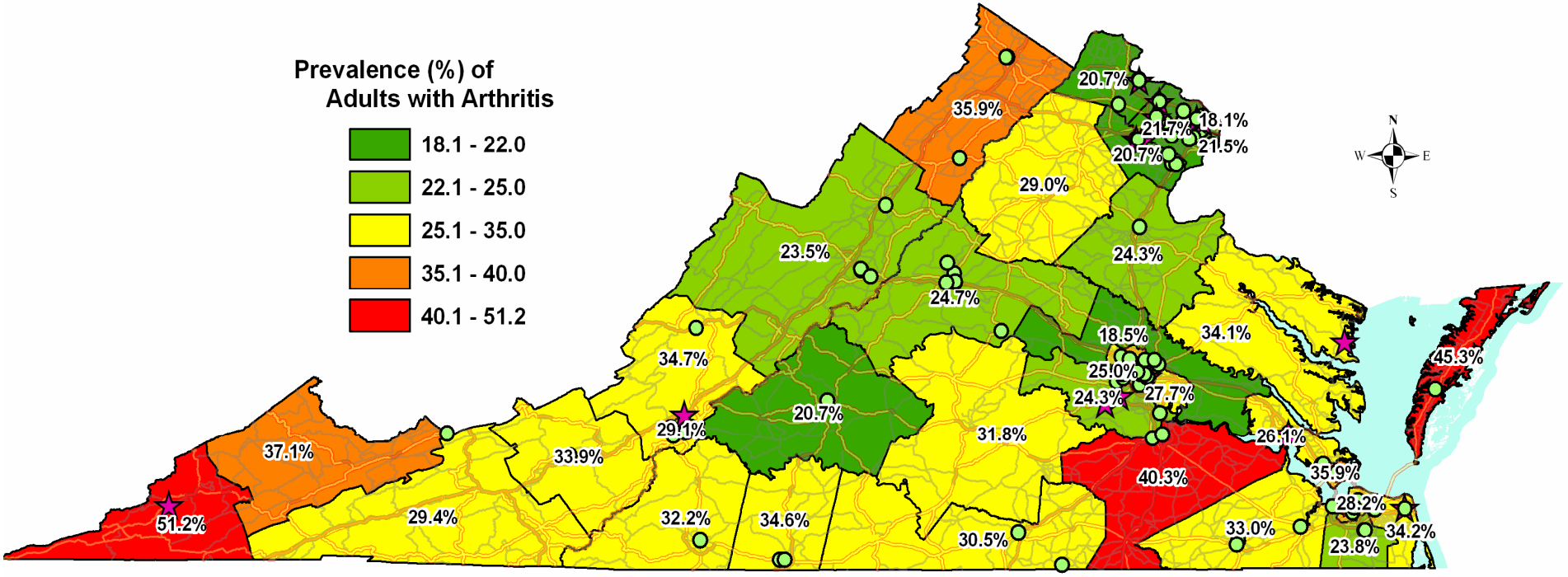
Service Area Analysis



Distribution of Board Certified Neurologists
Primary Stroke Centers (PSC) & Comprehensive Stroke Centers (CSC)
in
Virginia's Rural Areas



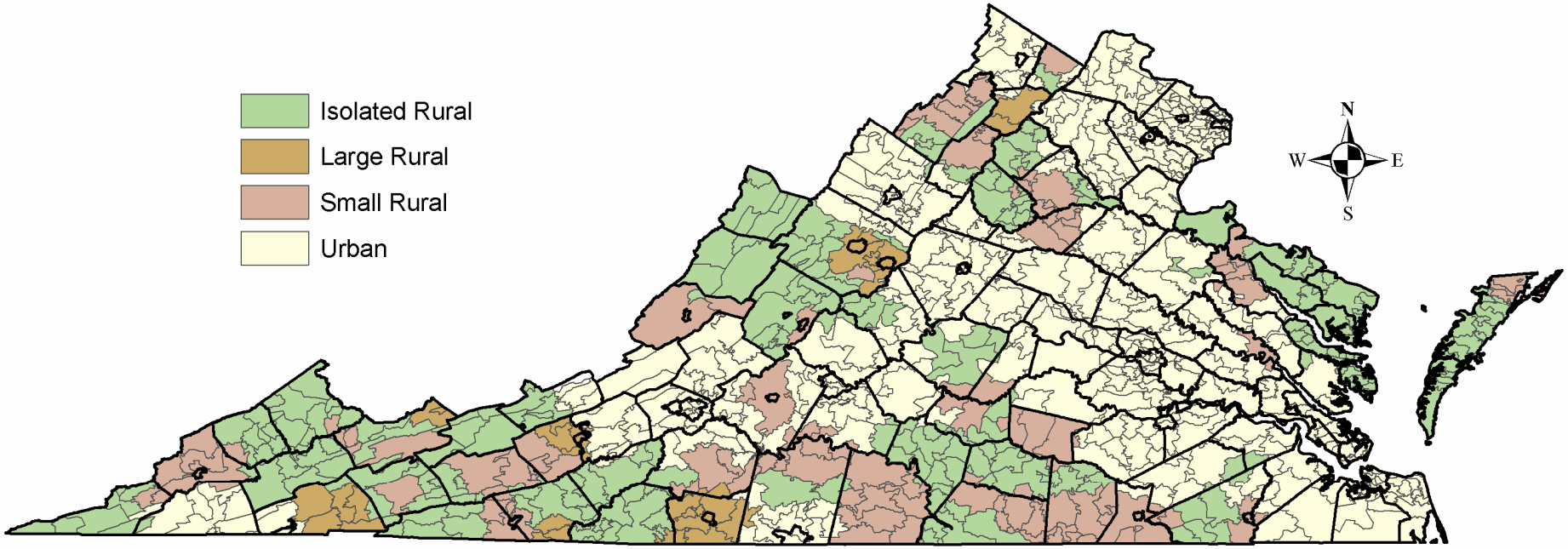
Prevalence of Arthritis (BRFSS, 2005) in Adults 18 & Over in Virginia's Local Health Districts



Practice Sites of Board Certified Rheumatologists are Noted with Stars Representing those Speaking Spanish

Isolated Rural Areas* in Virginia

Over 60 minutes travel time from an Urbanized Area

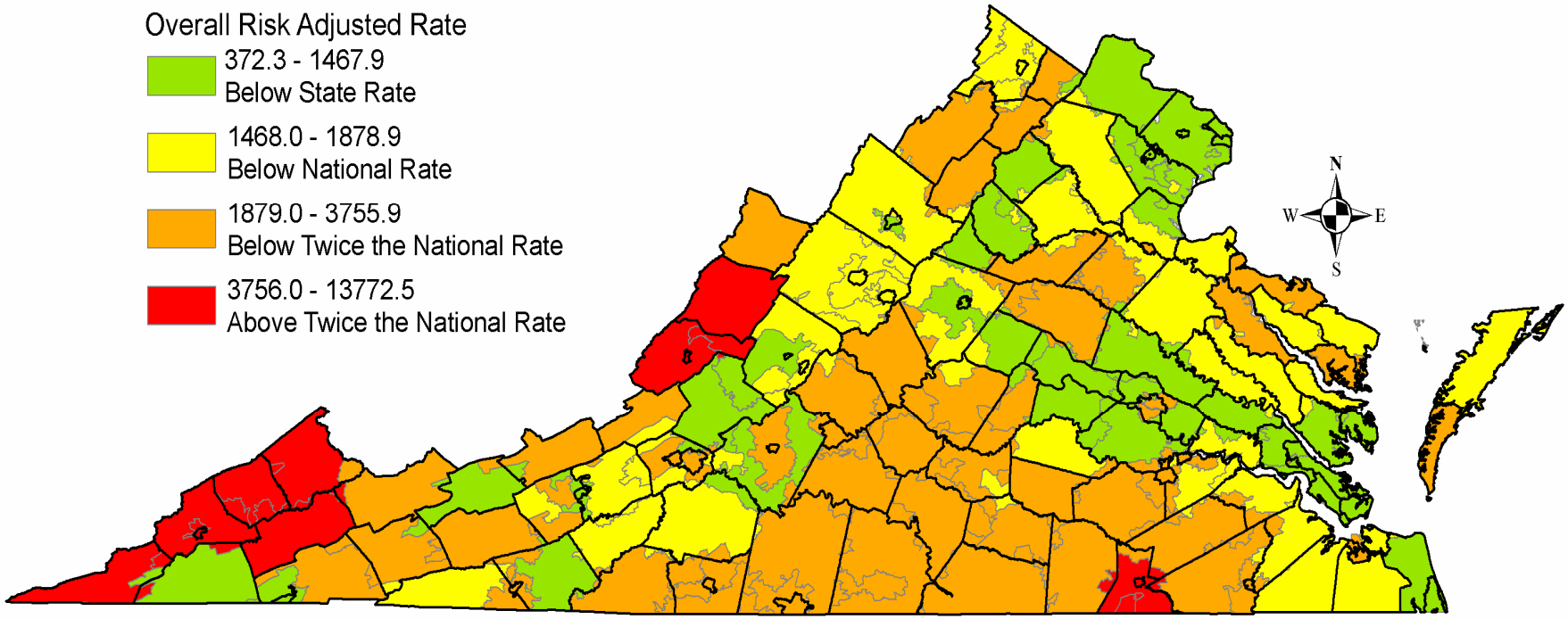


* Based on Rural Urban Commuting Codes, RUCA 2.0 - Zip Code Level.

Prevention Quality Indicator - Overall Composite Measure

(Includes all PQIs except Low Birth Weight and Perforated Appendix)

VHI, 2006



National rate per 100,000 population* is 1879**

State rate per 100,000 population* is 1468.

*Population age 18 years or older. Rates calculated by zip code definitions of county-city.

**Source: Nationwide Inpatient Sample, 2004, AHRQ Website: http://www.qualityindicators.ahrq.gov

Current Projects

- Develop multi-level framework
  - Georeferenced Health Data
  - High Priority Target Areas
    - Statewide identification of areas in crisis
  - Models of Care
    - Needs assessment for non-traditional models of care
  - Multivariate analysis using spatial regression
    - Distance, cost analysis for services and sentinel events
  - Longitudinal Studies
    - Neighborhood Change Database (Census 1970, 1980, 1990, 2000)
  - PRIZM NE database
    - Lifestyle and social marketing data
  - Claritas Demographics 2007 and 2008
    - Census tract, block group, and zip code level